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Introductory psychology students were subjects in an investigation to determine the covariation among achievement, attitudes toward a course, and attitudes taught as part of a course. In addition, data obtained allowed for evaluation of two theoretical models of pretest sensitization, the first in terms of learner involvement and the second in terms of pretest position. A total of 1,324 subjects received from one to five repeated measurements of the three variables, achievement, attitude toward the course, and attitude toward psychology. Curves were fitted to each variable over time. The resulting regression equations were compared as functions describing the variables under study. Partial correlation coefficients were used to assess the relationship between attitude scores and the final achievement score. Curves were fitted to high, medium, and low groups of each initial test distribution to assess pretest sensitization as a function of initial test distribution, while data on the three different variables was considered to represent three levels of involvement. Increase in achievement was best described by third and fourth degree equations. Attitude toward psychology did not change appreciably over the course of instruction. Attitude toward the course consistently declined. There was no evidence for either model of pretest sensitization. (LS)

FINAL REPORT

Contract No. OEC-4-6-051118-0563

RELATIONSHIP OF NEW EDUCATIONAL MEDIA TO NON-INTELLECTIVE FACTORS IN LEARNING

PHASE III

August 1967

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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THE COVARIATION OF ACHIEVEMENT AND ATTITUDE THROUGHOUT A LEARNING EXPERIENCE

The Relationship of New Educational Media to Non-Intellective Factors in Learning - Phase III

Contract No. OE-4-6-051118-0563

Charles O. Neidt

August 1967

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Colorado State University

Fort Collins, Colorado

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INTRODUCTION

A substantial amount of research evidence has been assembled which suggests that attitudes of learners toward a learning experience tend to become less favorable as a course progresses (5, 7). This conclusion has been reached in several different subject matter areas, throughout several age levels of learners, and across several instructional media. Changes in subject matter achievement accompanying the attitude changes have not been systematically investigated, however. In addition, no effort has been made to differentiate between attitudes which are deliberately taught by the instructor as an integral part of the course and those which are generated by the learner independently from the course content.

Whenever measures of modifiable behavior are obtained throughout a period of time, there is the possibility that initial measurements may affect subsequent measurements. This phenomenon has been recognized for some time and referred to in the literature as "pretest sensitization." Although some evidence of the operation of pretest sensitization has been assembled for both intellective and non-intellective behaviors, no research is available about the specific functioning of this phenomenon within each type of behavior or between the two behavioral types. In addition, whereas two theoretical models have been suggested to explain pretest sensitization (1, 3), in no instance have two analyses of both models been made of the same data.

The project reported herein was designed to contribute toward understanding the functioning of 1) attitude change in relation to achievement and 2) pretest sensitization. General and specific objectives by area were as follows:

General Objective, Covariation of Achievement and Attitude

To determine the covariation of achievement and attitude measures obtained throughout a learning experience.

Specific Objectives, Covariation of Achievement and Attitude

1. To determine the parameters of the learning curve for achievement in a general psychology course at the university level taught via instructional television.

2. To determine the parameters of curves representing attitude change during a general psychology course when the attitudes are defined as integral portions of the course objectives.

3. To assess the covariation exhibited among (a) achievement measures, (b) measures of attitudes toward the learning situation (method, expectation, fulfillment, and content), and (c) measures of attitudes which are defined as course outcomes in a general psychology course.

4. To determine the relationship between achievement-attitude covariation and (a) initial or pretest achievement, and (b) final achievement in a general psychology course.

General Objective, Pretest Sensitization

To evaluate two theoretical models explaining pretest sensitization, the first in terms of learner involvement and the second in terms of pretest attitude and favorability of the learning experience.

Specific Objectives, Pretest Sensitization

1. To evaluate the role of learner involvement in pretest sensitization by applying the Neidt six-group design to achievement data (maximum involvement), course attitude data (partial involvement), and attitude toward the course data (minimum involvement) in a general psychology course.

2. To evaluate the role of pretest position (favorable or unfavorable) in pretest sensitization by examining the parameters of mathematical equations for the remainder of the course based upon high, middle and low portions of the initial distribution for attitudes and achievement data.

3. To evaluate the role of general reaction toward the learning experience in relation to (a) involvement and (b) pretest position by applying the Neidt six-group design to attitude and achievement data in a general psychology course.

Design

The present study was an extension of a project by Neidt initiated in 1962 and supported by the United States Office of Education. In the earlier research five parallel forms of a 26-item scale measuring attitudes toward method, expectation, and content were administered to students of varying ages in 72 instructional settings. Since the attitudes of learners became progressively less favorable as the courses proceeded, it was considered essential to develop a research design which would assess the extent to which the changes in attitude might be the result of previous test administrations. The widely-used Solomon four-group design was extended to include six groups as follows:

	Administration				
Group	1st	2nd	3rd	4th	5th
I					X
II				X	X
III			X	X	X
IV		X	X	X	X
V	X	X	X	X	X
VI	X				X

This design requires five equivalent forms of an instrument for measuring each characteristic and a learning situation in which material is learned in six separate settings simultaneously. The design is ideally suited for the medium of educational television but not well suited for other instuctional media. The design also is well suited for investigating covariation in attitude and achievement as well as pretest sensitization. For the foregoing reasons, this design was employed in the present study in two university settings where videotaped instructional television was being used as the teaching medium.

A total of 1324 students enrolled in introductory psychology at Colorado State University and at the University of Missouri participated in this study. Detailed descriptions of the procedures involved in this study and its outcomes are contained in subsequent sections of this report.

METHOD

The objectives of the present study required that measures of three characteristics be obtained at specified points in time throughout a course. The three measures were as follows:

1. Attitudes involving the subject matter which were defined by the instructor as an integral part of the course objectives.

2. Attitude toward the course (attitude toward the method of instruction, toward the general content, and degree of expectation fulfillment offered by the course).

3. Achievement in the course (definition of terms, recall of information, application of principles, etc.).

Since a maximum of five administrations of the instruments were to be made during the course, it was necessary to construct five forms of each of the three measuring instruments used in the investigation. This section of the report contains a description of the situations in which the study was conducted, the samples on which it was based, the procedures used in constructing the fifteen forms of the measuring instruments and the analyses made of the data collected.

Situation and Sample

Three separate learning situations were utilized in the present study. Each situation was an introductory class in general psychology taught via a closed-circuit television lecture series. The Fall 1967 Introductory Psychology class at Colorado State University (N = 538), the Winter 1967 Introductory Psychology class at Colorado State University (N = 461) and the Spring 1967 Introductory Psychology class at the University of Missouri (N = 325) constituted the total sample for the investigation. The longitudinal nature of the study resulted in some reduction in the sample size in each situation as will be discussed later. Throughout the report the sample size in each analysis is specifically indicated. The breadkdown of the total sample by setting and administration is shown in Table 1.

Both of the Colorado State University courses were divided into sections of approximately 40 students each. The University of Missouri course was divided into sections of 25 to 30 students each.

Introductory psychology courses are composed primarily of freshman and sophomore students. However, as all majors in the two universities were represented, the sample was relatively representative of the general university population.

TABLE 1

Total Sample by Setting and Administration
(Number involved in each test administration)

Administrative Groups		1	2	3	4	5
I	CSU-F					36
	CSU-W					34
	MU					23
II	CSU-F				37	→
	CSU-W				36	→
	MU				23	→
III	CSU-F			29	→	→
	CSU-W			37	→	→
	MU			23	→	→
IV	CSU-F		36	→	→	→
	CSU-W		26	→	→	→
	MU		26	→	→	→
V	CSU-F	341	→	→	→	→
	CSU-W	296	→	→	→	→
	MU	186	→	→	→	→
VI	CSU-F	26	-------	-------	-------	→
	CSU-W	32	-------	-------	-------	→
	MU	44	-------	-------	-------	→

The same televised lecture series was presented to each of the CSU classes. However, the Winter Quarter was shorter than the Fall Quarter, necessitating a decrease from a total of 36 to 30 tapes. The CSU class met by section five times per week. Three or four of these section meetings were for televised lectures. The other one or two meetings were for discussion and review. Instructors in all sections were either graduate teaching assistants or regular faculty members. Class activity among sections was coordinated by a senior faculty member. Two hourly examinations were administered in both of the CSU quarters at night.

The University of Missouri class met by section three times per week. Two of these meetings were televised lectures and one was a discussion session. A total of 30 taped lectures, different from the CSU series, was presented. Again, section instructors were graduate teaching assistants and regular faculty members, and two hourly exams were administered at night during the semester.

Discussion sessions in all three situations were designed to allow close student-instructor interaction. Questions of students were discussed at this time, previously presented material was reviewed, or class administrative details were accomplished. Quizzes were administered as part of the discussion group routine.

Construction of the Instruments

Attitude Toward the Course. Ten items for measuring Attitude Toward the Course were chosen from an instrument developed by Neidt (7) and used in a variety of situations (2, 9, 10). The original items were constructed and edited from a pool of more than 500 attitudinal statements developed from an extensive review of the literature concerning attitude toward a learning situation and from a series of taped interviews with undergraduate students who had recently completed courses involving programmed instruction and educational television. The original set of items was judged by ten judges according to Thurstone's Method of Equal Appearing Intervals (11). Items selected were chosen on a basis of item content, Thurstone scale value, and index of ambiguity. Although the original Attitude Toward the Course Scale (7) was constructed to measure attitudes toward three separate aspects of the course, method of instruction, course content, and expectation fulfillment, the ten items chosen for the present study were selected as representing an attitude toward the course as opposed to an attitude involving the subject matter.

Attitude Toward Psychology. An analysis of the textbook utilized in Introductory Psychology at Colorado State University and several other widely-used texts yielded a taxonomy of areas in which attitudes were likely to be instructional objectives. Statements were drawn from the text and the taped lecture series to conform to the categories of this attitudinal taxonomy. A total of 97 statements conforming to the attitude taxonomy were constructed and edited for clarity and brevity.

These statements were submitted to the eight instructors who would teach the Fall CSU Instroductory Psychology course. These instructors judged each item as to whether they attempted to teach the attitude, attempted to discourage the attitude, or were neutral--neither encouraging nor discouraging the attitude in their students. The eight judges were three regular faculty members and five graduate teaching assistants, all of whom had had previous experience with Introductory Psychology. Only items on which all judges agreed perfectly about encouraging or discouraging were considered for inclusion in the final ten items.

The ten items chosen for the Final Attitude Toward Psychology scale also were submitted to the instructors teaching the University of Missouri Introductory Psychology course. This procedure was followed to assure comparability of course objectives between the two schools. All the Missouri instructors, including the faculty coordinator for Introductory Psychology who had had more than 30 years' experience with the course, agreed that they were committed to teaching the attitudes represented by the items.

The attitude taxonomy developed to represent the relevant attitudinal areas of Introductory Psychology, along with the original number of statements in each area, and the final number of statements chosen from each area are illustrated in Table 2.

Attitude Scales. Only ten Attitude Toward Psychology and ten Attitude Toward the Course items were chosen to keep the administration time of attitude items at a minimum. To facilitate administration, all 20 items were combined on one form with common instructions to the subject. The first ten items on the form constituted the Attitude Toward the Course Scale while the second ten items (numbers 11 through 20) were the Attitude Toward Psychology Scale.

All items were cast in a Likert (14) format with a five-point constant response scale. The response scale was weighted zero through four, with four being the most favorable response. Thus,

Table 2

Attitude Taxonomy of Introductory Psychology Topics With Number of Original Statements in Each Category and Number Chosen for Final Scale

Category	Number of Original Statement	Number of Final Statement
Attitude Toward the Study of Psychology	19	1
Scientific Method	17	3
Human-Animal Differences	10	2
External Control (Behavioral Determinism)	12	1
Individual Differences	11	3
Mental Abnormality	18	0
Sensation and Perception	3	0
Miscellaneous	7	0
TOTAL	97	10

positive response statements were scored: Strongly Agree (SA), 4; Agree (A), 3; Neutral (N), 2; Disagree (D), 1; and Strongly Disagree, (SD), 0. Negative or unfavorable statements were weighted exactly opposite: SD = 4 through SA = 0. A total score for each attitude scale (Toward the Course or Toward Psychology) was obtained by summing the weighted responses to the appropriate ten items. Each score was kept separate throughout the investigation.

Since the longitudinal design of the study required five repeated measurements, it was also necessary to construct five equivalent forms of the attitude scales. This was accomplished by changing key words in statements while retaining original meanings and by rearranging items in a random order within each scale. The random rearrangement of items was done to counterbalance any response bias which might be attributable to fixed response sequence. The five forms of the attitude scales, labelled Form A through Form E (Appendix) were administered alphabetically throughout each of the three learning situations.

To assure that attitude items were discriminating among individuals with different attitudes, a random sample of 100 subjects was drawn from the CSU Fall situation. This group was divided into a high 50% and low 50% on the basis of total scores on each form of the two attitude scales. Mean weighted item responses for the high group and for the low group were calculated for each form of the two scales. The difference between the mean weighted score of the high group and the mean weighted score of the low group indicated the extent and direction of differentiation of the item (Table 3). All items on all forms satisfactorily differentiated the high and low groups in the expected direction with one exception on Form E.

Reliability of the Attitude Scales. The reliability of the attitude scales was estimated in two ways. First, the split-half coefficient of correlation corrected by the Spearman-Brown Prophecy Formula was calculated for each of the five forms from the responses to odd and even-numbered items by 100 subjects drawn randomly from the CSU Fall class (Table 4). Second, the correlations between adjacent scores from administrations of the scale were calculated (Tables 5 and 6). The adjacent administration reliabilities were a slight underestimate of reliability since a different form of the scales was administered each time.

The split half reliability estimates for the Attitude Toward the Course scale ranged from .446 to .895 for various forms, with all but one coefficient approximately .80. Split-half coefficients for the Attitude Toward Psychology Scale were somewhat lower, ranging

Table 3

Difference Between Mean Weighted Item Scores of High 50% and Low 50% of Total Attitude Scale Scores (N=100)

	ATTITUDE SCALE FORM														
STATEMENT	A			B			C			D			E		
	H	L	D	H	L	D	H	L	D	H	L	D	H	L	D
I like the content of this course very much.	3.4	2.6	+ .8	3.3	2.5	+ .8	3.3	2.6	+ .7	3.0	2.2	+ .8	3.0	2.2	+ .8
I am satisfied with the method used in teaching this course	3.1	2.6	+ .5	3.2	2.4	+ .8	3.2	2.3	+ .9	3.1	2.1	+1.0	2.9	1.6	+1.3
Too much time in this course is spent on topics that are unimportant.	3.3	2.5	+ .8	3.0	2.2	+ .8	3.1	2.3	+ .8	2.9	2.2	+ .7	2.8	1.8	+1.0
I am glad I took this course.	3.6	2.6	+1.0	3.7	2.7	+1.0	3.4	2.7	+ .7	3.4	2.6	+ .8	3.3	2.5	+ .8
This course has increased my interest in psychology.	3.4	2.3	+1.1	3.4	2.5	+ .9	3.2	2.6	+ .6	3.0	2.3	+ .7	3.4	2.4	+1.0
This course has been a disappointment to me.	3.3	2.3	+1.0	3.0	2.6	+ .4	3.3	2.5	+ .8	2.9	2.0	+ .9	3.0	1.9	+1.1
The amount of material covered in this course is about right.	2.7	2.3	+ .4	3.3	2.5	+ .8	3.0	2.4	+ .6	2.9	2.5	+ .4	2.8	2.3	+ .5
The study of psychology is not worth the time it takes.	3.7	3.1	+ .6	3.9	3.0	+ .9	3.6	3.0	+ .6	3.3	2.2	+1.1	3.2	2.2	+1.0

(continued)

STATEMENT	A			B			C			D			E		
	H	L	D	H	L	D	H	L	D	H	L	D	H	L	D
The method of instruction in this course could be improved a lot.	2.6	2.0	+ .6	3.7	2.0	+1.7	2.8	1.8	+1.0	2.6	1.1	+1.5	2.6	1.6	+1.0
I had hoped that this course would be better than it is.	3.5	2.7	+ .8	3.1	2.3	+ .7	3.0	1.8	+1.2	2.8	1.7	+1.1	2.9	1.6	+1.3
ATTITUDE TOWARD PSYCHOLOGY															
The scientific method is inappropriate for studying human behavior.	3.2	3.1	+ .1	3.1	2.5	+ .6	3.2	2.5	+ .7	2.7	2.6	+ .1	3.0	2.7	+ .3
Human behavior is influenced by many of the same forces that influence animal behavior	2.9	2.8	+ .1	2.9	2.0	+ .9	3.1	2.7	+ .4	3.5	2.6	+ .9	2.7	2.7	0.0
The adult human depends on instincts more than we realize.	2.6	2.0	+ .6	2.8	2.4	+ .4	2.6	2.1	+ .5	2.7	2.2	+ .5	2.5	2.1	+ .4
The causes of behavior can be learned.	2.0	1.7	+ .3	2.0	1.9	+ .1	3.2	2.5	+ .7	3.0	2.7	+ .3	3.0	2.7	+ .3
All people have the same potential to learn.	3.4	3.1	+ .3	3.3	2.9	+ .4	3.2	2.9	+ .3	3.5	3.1	+ .4	3.3	3.1	+ .2
Psychology offers great promise for improving man's existence.	3.3	2.7	+ .6	3.5	2.5	+1.0	2.9	2.7	+ .2	3.2	2.8	+ .4	3.4	2.8	+ .6
All aspects of life, no matter how intimate, are worthy topics for research.	3.1	2.5	+ .6	3.2	2.6	+ .6	2.9	2.4	+ .5	3.1	2.4	+ .7	3.0	2.7	+ .3

(continued)

STATEMENT	A			B			C			D			E		
	H	L	D	H	L	D	H	L	D	H	L	D	H	L	D
Psychology tests are scientific instruments.	3.0	2.6	+ .4	3.1	2.5	+ .6	2.9	2.5	+ .4	3.1	2.6	+ .5	3.1	2.8	+ .3
It will never be possible to predict human behavior with any degree of accuracy.	3.0	2.6	+ .4	3.0	2.4	+ .6	2.9	2.3	+ .6	3.1	2.2	+ .9	2.9	2.4	+ .5
Intelligence is entirely inherited.	3.3	2.8	+ .5	3.3	3.1	+ .2	3.3	2.9	+ .4	3.3	2.9	+ .4	3.2	3.0	+ .2

TABLE 4

Attitude Scale -- Odd-Even Correlations Corrected by Spearman-Brown Prophecy Formula (N=100)

Form	Corrected Reliability Attitude Course	Attitude Psychology
A	.895	.354
B	.792	.829
C	.859	.638
D	.886	.491
E	.446	.572

TABLE 5

Correlation Coefficients Between Adjacent Administrations of the Attitude Toward the Course Scale

	Administrations			
Class	1&2	2&3	3&4	4&5
CSU Fall	.72	.77	.78	.86
CSU Winter	.77	.78	.83	.86
Missouri	.77	.75	.84	.87

TABLE 6

Correlation Coefficients Between Adjacent Administrations of the Attitude Toward Psychology Scale

	Administrations			
Class	1&2	2&3	3&4	4&5
CSU Fall	.60	.68	.76	.83
CSU Winter	.66	.76	.72	.71
Missouri	.58	.56	.66	.72

from .354 to .829, with the majority approximately .60 or higher. It would have been desirable if the reliability estimates for the Attitude Toward Psychology scale had been higher. It should be noted that the scale was comprised of only ten items, however, and these had not been subjected to as much analysis as had the Attitude Toward the Course items.

Test-retest estimates of reliability for both scales, based on correlations between scores of adjacent administrations, were consistently high. As noted earlier, the test-retest coefficients probably underestimate true reliability due to differences in forms of the attitude scales between administrations. The adjacent administration correlations were based on the total N in each learning situation.

Adjacent administration correlation coefficients were consistently high for both scales in all three learning situations. The estimated reliability of the Attitude Toward Psychology scale was again somewhat lower than that for Attitude Toward the Course scale. There was some evidence of an increasing relationship between two adjacent sets of scores as a course progressed. However, this increased correlation in no case was markedly high, indicating that a repeated measures or constant response bias was operating minimally.

Independence of the Attitude Scales. To establish that the two attitude scales constructed for use in the study were actually independent, measuring different attitudinal variables, an analysis for homogeneity was made on the data from 100 randomly-drawn scales from the CSU Fall class for each form of the scales. The analysis for homogeneity (6) involves application of the analysis of variance to responses of subjects to items within a scale versus responses to items among or between scales. The data utilized for the analysis include all possible inter- and intra-correlations between odd- and even-numbered items within and between attitude scales. The resulting F-test indicates whether or not the scales represent homogeneous behavior. The tests for homogeneity are shown in Tables 7, 8, 9, 10 and 11.

The formula for the test of homogeneity is:

$$F = \frac{1 + \bar{r}_w - 2(\bar{r}_a)}{1 - \bar{r}_w}$$

where: $\bar{r}_w$ = average intra scale coefficient

$\bar{r}_a$ = average inter scale coefficient

The degrees of freedom associated with the resulting F-value are $(N - 1)(K - 1)$ for the numerator and $(N - 1)$ for the denominator, where N is the number of subjects and K is the number of scales.

It can be seen from Tables 7 through 11 that all forms of the two scales deviated significantly from homogeneity at the .01 level of confidence. It was concluded that Attitude Toward Psychology and Attitude Toward the Course scales measured separate and independent attitudinal variables.

In addition the coefficients' correlation between scores on each scale at each administration were calculated from the total N in each class (Table 12). Although there is a slight consistent relationship between the two scales in all situations, it is evident by comparing these correlations with the reliabilities previously reported that the scales were measuring different variables.

Achievement Measurement. Five successive achievement measures were necessary to detect changes in achievement during a course of

TABLE 7

F-Test for Homogeneity Between the Attitude Toward Psychology and Attitude Toward the Course Scales, Form A (N=100)

Area		Attitude Course	Attitude Psychology	
		Even	Odd	Even
Attitude Course	Odd	.895	.186	.480
	Even		.309	.643
Attitude Psychology	Odd			.354
	Even			

$$\text{Total } F = \frac{1 + \bar{r}_w - 2(\bar{r}_a)}{1 - \bar{r}_w} = \frac{1 + .72 - 2(.42)}{1 - .72} = 3.142^{**}$$

(d.f. = 99.99)

** Significant at the .01 level

TABLE 8

F-Test for Homogeneity Between the Attitude Toward Psychology and Attitude Toward the Course Scales, Form B (N=100)

Area		Attitude Course	Attitude Psychology	
		Even	Odd	Even
Attitude Course	Odd	.792	.451	.548
	Even		.378	.587
Attitude Psychology	Odd			.829
	Even			

Total $F = \dfrac{1 + \bar{r}_w - 2(\bar{r}_a)}{1 - \bar{r}_w} = \dfrac{1 + .81 - 2(.50)}{1 - .81} = 4.26^{***}$ (d.f. = 99,99)

** Significant at the .01 level

TABLE 9

F-Test for Homogeneity Between the Attitude Toward Psychology and Attitude Toward the Course Scales, Form C (N=100)

Area		Attitude Course	Attitude Psychology	
		Even	Odd	Even
Attitude Course	Odd	.859	.454	.411
	Even		.479	.445
Attitude Psychology	Odd			.638
	Even			

Total $F = \dfrac{1 + \bar{r}_w - 2(\bar{r}_a)}{1 - \bar{r}_w} = \dfrac{1 + .77 - 2(.45)}{1 - .77} = 3.782^{**}$ (d.f. = 99,99)

** Significant at the .01 level

TABLE 10

F-Test for Homogeneity Between the Attitude Toward Psychology and Attitude Toward the Course Scales, Form D (N=100)

Area		Attitude Course	Attitude Psychology	
		Even	Odd	Even
Attitude Course	Odd	.886	.439	.533
	Even		.318	.574
Attitude Psychology	Odd			.491
	Even			

Total $F = \frac{1 + \bar{r}_w - 2(\bar{r}_a)}{1 - \bar{r}_w} = \frac{1 + .75 - 2(.47)}{1 - .75} = 3.24^{**}$ (d.f. = 99,99)

** Significant at the .01 level

TABLE 11

F-Test for Homogeneity Between the Attitude Toward Psychology and Attitude Toward the Course Scales, Form E (N=100)

Area		Attitude Course	Attitude Psychology	
		Even	Odd	Even
Attitude Course	Odd	.466	.387	.239
	Even		.457	.233
Attitude Psychology	Odd			.572
	Even			

$$\text{Total } F = \frac{1 + \bar{r}_w - 2(\bar{r}_a)}{1 - \bar{r}_w} = \frac{1 + .52 - 2(.33)}{1 - .52} = 1.79^{**}$$

(d.f. = 99,99)

** Significant at the .01 level

TABLE 12

Correlation Coefficients Between Attitude Toward Psychology Scale Scores and Attitude Toward the Course Scale Scores at the Same Administration

	Administration				
Class	1	2	3	4	5
CSU Fall	.32	.37	.38	.34	.35
CSU Winter	.25	.28	.39	.23	.33
Missouri	.17	.18	.21	.22	.22

instruction. A pool of approximately 500 objective achievement items was constructed from an analysis of the textbook and TV lectures. The items in this pool were administered to 77 students taking a summer course in Introductory Psychology at Colorado State University. Items which successfully differentiated high from low achievers in this pretest series were maintained in the item pool.

The primary purpose of the repeated achievement measure was to differentiate student progress on the basis of class achievement or learning. A traditional learning curve with equal-interval increments was not necessary for purposes of the study. For this reason no attempt to equate the difficulty level or content of all items in the item pool was made.

It was arbitrarily decided to cover each 20% portion of a course with five achievement items. Moreover, it was reasoned that items covering those parts of the course which had not yet been presented would not be answered correctly. Therefore, only items based on topics previously presented in class were administered at any one time. Following this procedure, the final achievement test included 25 items, five of which were based on topics presented in the final 20% of the class. The other 20 items in the final test were based on topics covered since the beginning of the class. A similar pattern was followed for all achievement tests with the exception of the first.

Following the first 20% of the course, section instructors administered quizzes of their own construction. The scores on these quizzes in the CSU situations were transformed to standard scores with a mean of 2.5 and standard deviation of one, based on within-section score distributions. The raw scores of a five-item quiz were utilized from the Missouri situation. After the first administration all achievement items were the same for all students. These items were chosen by the coordinating instructor in each class. The criterion for choosing items was that five items were representative of topics covered during the immediately preceding 20% of the course, and that remaining items were representative of all topics covered previous to the immediately preceding 20% of the course. Thus, an increment of five achievement items was added at each administration to obtain achievement measures. In this manner, the number of items at each successive administration was 5 (based on a standardized score), 10, 15, 20, and 25. In each case, items were representative of all topics covered in class to that point in the class. Achievement test scores were the number of correct responses.

Content validity of the achievement tests was attempted by the methods of item construction and selection. The split-half reliability of all administrations was estimated from responses to the odd and even numbered items of a random sample of 100 subjects drawn from the CSU Fall class. The split-half reliability coefficients, corrected by the Spearman-Brown Prophecy Formula are listed in Table 13. In addition, to assure that the final achievement test was reliable enough to serve as an independent variable in the regression analysis in this study, the split-half reliability of the final Missouri achievement test was calculated from data based on the responses of a random sample of 25 students.

Reliability coefficients for the achievement tests were relatively small, with the exception of that for the final test (.75). The split-half reliability coefficient based on the Missouri final test data was .46 uncorrected and .63 corrected.

Test-retest reliability of the achievement tests was further investigated by calculating correlation coefficients between scores of adjacent administrations of the tests (Table 14). These correlations were based on the total N in each class. Correlation coefficients between adjacent administrations averaged about .40. It should be noted that successive achievement tests in all cases included different items, with only a given proportion of items in the second test based on concepts covered by the first test.

TABLE 13

Split-Half Reliability Coefficients of Achievement Measures (N=100)

Split-Half	Administration				
Reliability Coefficient	1	2	3	4	5
Uncorrected	--	.22	.31	.15	.60
Corrected	--	.36	.47	.26	.75
Number of Items	--	10	15	20	25

TABLE 14

Correlation Coefficients Between Adjacent Administrations of the Achievement Tests

	Administrations			
Class	1&2	2&3	3&4	4&5
CSU Fall	.24	.36	.40	.42
CSU Winter	.26	.31	.83	.38
Missouri	.32	.35	.44	.44

The relatively low estimates of reliability obtained for the achievement tests were probably attributable to the heterogeneous nature of the items plus the small number of items. Correlations between adjacent administrations increased as the number of items in the tests increased, reflecting the effect of test length on reliability.

Data Collection

At the beginning of the class period when the first scale was administered, instructors read a standard prepared statement to students (Appendix). This statement briefly explained the purpose of the study and furnished students a chance to examine the attitude scales before responding. The only difference in the prepared statements read to the Colorado State University classes and the Missouri class was the name of the school and whether the student was requested to put his name on the scale (CSU) or his student identification number (Missouri).

Attitude scales were administered by section instructors at approximately the end of each 20% of the respective courses. The order of administration of all scale forms in all three situations was Form A, Form B, Form C, Form D and Form E.

To assure that student responses would not be biased by the possibility of instructors examining completed attitude scales, the scales were turned in to a student monitor who enclosed all the scales for his section in a sealed envelope. This envelope was then turned in to a central collection point.

Achievement measures were obtained either as part of regular one-hour examinations or as a quiz administered in section meetings. Essentially the same procedure was followed in all three class situations. Inclusion of achievement items in the context of a regular quiz or test assured that students would respond to the best of their ability.

As noted earlier, the first achievement measure was taken from an actual class quiz administered by section instructors. Ten items were included in a regular hour examination at the end of 40% of the course. A 15-item quiz was administered by section at the end of 60% of the course. An hour examination was administered at the end of 80% of the course. Since this examination included items covering material presented since the last hour test only, a short quiz covering material previous to the first hour examination was administered by sections. Both hour examinations were administered at night to the entire class. The final examination included 25 keyed items covering the entire course of instruction in proportion to the time devoted to each topic.

It should be noted that following the first quiz the keyed achievement items at each administration were the same for all students within a given class. Achievement items at any given administration were not necessarily the same between class situations, but keyed items were drawn from the same item pool and were judged to be representative of the subject matter previously presented in class.

Analysis of the Data

Since the present investigation involved two genral types of objectives, one related to curve fitting and the other to pretest sensitization, two sets of analyses of results were undertaken. The first general analysis involved fitting curves to each of the attitudinal variables and the achievement variable over time so that functions describing each variable could be compared. Relationships between each attitude variable over time and the final achievement measure were then computed. The second general analysis involved contrasting the mean scores of all sections of each course at each of the five test administrations. This contrast was made to determine whether there was evidence of the differential influence of pretest sensitization among the three types of variables studied. Curves were also fitted to the high, middle, and low initial scorers on each variable in each situation. This procedure was followed to evaluate the objectives related to the relationship between initial position in a distribution and pretest sensitization.

Curve Fitting. The problem of curve fitting or trend analysis is to determine the mathematical function which most adequately accounts for the total variation in the sample data. The function which expresses the relationship between variables is actually an estimate of the parameters of the function in the population from which the sample was drawn. A polynomial regression analysis based on the method of least squares was utilized as the curve-fitting procedure in this study (8).

Polynomial regression analysis utilizes the analysis of variance to sequentially test the proportion of total variance accounted for by polynomial equations of varying degrees. A correction for the total mean is calculated (b_0). Then, the proportion of total variance attributable to the first-degree (linear) component of variation after the correction in total variance due to the mean line (b_1/b_0) is subjected to an F-test. This procedure is followed in a sequential manner through higher-order equations. The resulting F-test for each polynomial equation actually tests the significance of the resulting regression coefficient ($b_i/b_{i-1}, \ldots b_0$) from zero, thus indicating the contribution of the coefficient to the polynomial equation describing the data.

F-tests in the polynomial regression analysis take the form:

$$F = \frac{\text{mean square due to } b_i/b_{i-1}, \;. \;. \;.b_0}{\text{residual mean square}}$$

It is important to note that these F-ratios assess the significance of the additional reductions in the residual sum of squares achieved by fitting regression coefficients in the order indicated. In this study, F-ratios were calculated sequentially beginning with a correction for the mean line and proceeding from a first-degree equation through successive higher-order equations.

For each polynomial regression analysis, an equation of the following form was generated:

$$\hat{Y} = b_0 + b_1X_1 + \;. \;. \;. + b_kX_k$$

where $\hat{Y}$ is the dependent variable, Attitude Toward Psychology, Attitude Toward the Course, or Achievement;

X = administration;

and k = the highest degree regression coefficient resulting in a significant reduction in the residual sum of squares.

The polynomial analysis of regression was carried through the fifth-degree equation for all variables in the study. This procedure was followed to assure that the highest-degree component of variation contributing significantly to the total variance was identified. An alternate procedure, to test for the significance of the deviation from regression after each component was calculated, could have been followed. However, since calculations were programmed for a CDC 6400 computing system it was as convenient to obtain the more complete analysis.

The regression equation resulting from the polynomial regression analysis: 1) indicates the degree of the mathematical function which most accurately describes the repeated measures data; 2) indicates the shape of the curve describing the data; 3) yields unbiased estimates of the population regression coefficients; and 4) yields an index of correlation (R^2) which indicates the total proportion of criterion variation accounted for by the predication equation, an indication of goodness of fit.

The last step in the initial curve-fitting procedures was to plot the predicted curves for the three variables pertaining to each class on the same coordinates. This was accomplished by solving the appropriate equation for each variable at each value of X (administrations) and converting the resulting values to a percentage of the total possible score for that variable. In this manner, it was possible to examine variable curves resulting from each learning situation and to make inferences about possible relationships between the variables.

Prediction of Final Course Achievement. To determine the relationship between each of the attitudinal variables and final course achievement as measured by the fifth achievement measure (Ach_5) a multinomial linear regression analysis based on the least squares principle was employed (8). The multinomial regression analysis is similar to a conventional analysis of multiple regression except for the sequential inclusion of the repeated measures and the resulting sequential reduction of the toal sum of squares.

Separate regression analyses of the relationship between the five administration scores of each attitude and the fifth achievement measure were made. As in the polynomial regression analysis, a correction for the mean line was first made. Then the sum of squares associated with administration on regression after the sum of squares due to the mean line had been determined was calculated. The same procedure was followed sequentially through all five administrations of the particular attitude scale. In this manner, the source of variation due to the fifth administration would be termed sum of squares due to $Attitude_5$ regression given that the sum of squares due to $Attitude_4$, $Attitude_3$, $Attitude_2$, $Attitude_1$, and the mean have been determined (b_6/b_5, b_4, b_3, b_2, b_1, b_0). The multinomial regression analysis yields regression coefficients (b_i) for each source of variation (X_i) and a multiple correlation coefficient (R).

The resulting linear regression equation has the form:

$$\hat{Y}_j = b_0 + b_1X_{1j} + \ldots + b_iX_{ij}$$

The F-ratio in the analysis of variance associated with the multinomial regression analysis takes the form:

$$F = \frac{\text{mean square due to } b_ib_{i-1}, \ldots b_0}{\text{mean square residual}}$$

This F-ratio tests the significance of the associated regression coefficient (b_i) from zero, and at the same time, tests the significance of the partial correlation between the predictor variable (X_i) and the criterion ($\hat{Y}$) given that the variation due to $X_{i-1}, \ldots X$ has been determined. The partial correlation between any X variable and $\hat{Y}$ is determined by the proportion of residual variation accounted for by the regression of that X variable. The logic of calculating partial correlations from sequential reductions in residual variation is obvious in a longitudinally designed study involving repeated measures. For example, the partial correlation between X_1 and $\hat{Y}$ with the variation due X_2 through X_5 controlled would have little practical meaning in terms of an actual prediction situation.

Analysis of Variance of Administrations: To assess the possible differential operation of pretest sensitization among the three types of variables studied, a series of single classification analysis of variance computations was made for each situation for each variable. The basic concept on which this calculation was based was that if pretest sensitization were operating as a factor causing sequential scores to decrease, those groups experiencing the largest number of consecutive administrations would score lowest. To provide maximum efficiency in the analyses, mean scores of individual sections within courses were considered in the analyses.

Curve Fitting by Initial Position: The final analysis consisted of fitting curves to the upper 30%, the middle 40% and the lower 30% of the initial distribution in each situation studied. The procedure was identical with that described in the foregoing discussion of curve fitting. This analysis was made to assess the possibility that pretest sensitization is related to initial test distribution position.

Summary of Method

In summary, three separate Introductory Psychology courses were utilized as the experimental situations. Five repeated measurements of the three variables in the study, Attitude Toward Psychology, Attitude Toward the Course and Achievement, were made to detect changes during a course of instruction. Two ten-item attitude scales were constructed in five equivalent forms, and a pool of objective achievement items was constructed covering topics presented in the course. Attitude and achievement measures were obtained subsequent to each 20% of the course of instuction according to a six-group modified Solomon design. Achievement tests were designed so as to cover each 20% of the course of instruction with five items and to cover subject matter presented since the beginning of the course at each administration. Thus, subsequent achievement measures each had five additional items resulting in a total of 25 items in the final achievement test.

Each of the three learning situations was treated separately in the analyses. Curves were fitted to each variable over time, utilizing a polynomial regression analysis. The resulting regression equations were compared as functions describing the variables under study. Inferences concerning points at which changes in one variable were related to changes in other variables were also made. The relationship between each attitude administration score and the final achievement score was also assessed by calculating partial correlation coefficients between attitude administration scores and final achievement. Analyses of variance were computed within each test administration point and groups having had several test administrations were compared with those having had fewer test administrations. Curves were then fitted to the upper 30%, middle 40% and lower 30% of each initial test distribution to assess pretest sensitization as a function of initial test distribution position.

RESULTS

In the following sections the curve fitting procedures will be presented by class situation. Next, the relationships between attitude measures and final achievement will be shown. Comparisons between functions describing different variables will then be presented. Analyses of variance among sections at each administration point will then be reported. Finally, curves will be discussed based upon initial test distribution for each variable by situation.

Fall Quarter CSU Introductory Psychology

The mean scores of Attitude Toward Psychology, Attitude Toward the Course, and Achievement for CSU Fall students are shown by administration in Table 15. the Attitude Toward Psychology scores were nearly constant throughout the course, showing a slight increase at about the middle of the learning experience. Attitude Toward the course dropped slightly during the first 60% of the course, then fell more sharply at the end of the course. Achievement steadily increased as expected, with a slight plateau during the middle of the course.

TABLE 15

Mean CSU Fall Attitude Toward Psychology, Attitude Toward The Course, and Achievement Scores by Administration (N=384)

	Administration				
Score	1	2	3	4	5
Attitude Psychology	27.62	27.40	28.17	28.07	28.02
Attitude Course	28.81	28.34	27.90	26.54	25.52
Achievement	2.52	8.36	9.40	15.32	19.76

The polynomial regression analysis of the Attitude Toward Psychology scores over time indicated that the function best describing this data was essentially linear (Table 16). However, it should be noted that the mean line accounts for the largest proportion of total variation. This phenomenon is primarily due to the large number of data points (1,920) to be accounted for by a single function. It will be noted that the proportion of variation accounted for by the linear equation (R^2) is extremely small.

The regression analysis of the Attitude Toward the Course scores also yielded a linear regression equation (Table 17). As noted from the administration means shown in Table 15, the regression line is falling slightly. Again, the largest proportion of variation is accounted for by the mean line, with the linear regression line accounting for a relatively small amount of total variation ($R^2 = .040$). There was a near-significant quadratic component of variation noted in the Attitude Toward the Course scores.

A quartic (fourth-degree) function best described the CSU Fall achievement data (Table 18). The equation reflects the plateau in mean scores noted earlier (Table 15). The shape of the curve for this achievement data over time approximates the shape of a conventional learning curve even though the achievement measures were not specifically designed to yield such a curve. The equation fitted to the CSU Fall achievement data very adequately accounted for total variation ($R^2 = .878$). The largest proportion of variation was attributable to the linear component.

To assure that the use of raw data from each student in a class in the analyses did not mask the differential effects of individual section instructors on the responses of students in their respective sections, a polynomial regression analysis was made utilizing the 11 section means of the CSU Fall class Attitude Toward Psychology scores. If section instructors had some type of differential effect on student attitudes, the form of the function describing attitude score section means should be different than the function describing the attitude means of the combined class.

As can be seen from Table 19, the equation for Attitude Toward Psychology based on section means is almost exactly the same as the equation based on the entire class. Section instructors

TABLE 16

Polynomial Regression Analysis of CSU Fall Attitude Toward Psychology Scores by Administration

Source of Variation[a]	df	Sum of Squares	Mean Square	F
b_0	1	1489807.963	1489807.963	89839.664**
b_1/b_0	1	81.959	81.959	4.942*
$b_2/b_1,b_0$	1	7.515	7.515	.453
$b_3/b_2,b_1,b_0$	1	34.126	34.126	2.058
$b_4/b_3,b_2,b_1,b_0$	1	41.643	41.643	2.511
$b_5/b_4,b_3,b_2,b_1,b_0$	1	.000	.000	.000
Residual	1914	31739.794	16.583	
TOTAL	1920	1521713.000		

*Significant at the .05 level of confidence

**Significant at the .01 level of confidence

b_0=27.417 b_1=.146

R^2=.003 R=.051

[a] The notation used: b_0= regression due to the means, b_1/b_0= linear (first-degree)regression given that regression due to the mean has been determined, etc.

TABLE 17

Polynomial Regression Analysis of CSU Fall Attitude Toward the Course Scores by Administration

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	1443926.255	1443926.255	42294.596**
b_1/b_0	1	2701.782	2701.782	79.139**
$b_2/b_1,b_0$	1	112.880	112.880	3.306
$b_3/b_2,b_1,b_0$	1	3.565	3.565	.104
$b_4/b_3,b_2,b_1,b_0$	1	27.069	27.069	.793
$b_5/b_4,b_3,b_2,b_1,b_0$	1	.000	.000	.000
Residual	1914	65343.451	34.140	
TOTAL	1920	1512115.000		

**Significant at the .01 level of confidence

b_0=29.940 b_1= -.893

R^2=.040 R=.199

TABLE 18

Polynomial Regression Analysis of CSU Fall Achievement Scores by Administration

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	235321.633	235321.633	47526.859**
b_1/b_0	1	65985.084	65985.084	13326.713**
$b_2/b_1,b_0$	1	120.241	120.241	24.285**
$b_3/b_2,b_1,b_0$	1	422.676	422.676	85.366**
$b_4/b_3,b_2,b_1,b_0$	1	1413.501	1413.501	285.478**
$b_5/b_4,b_3,b_2,b_1,b_0$	1	.000	.000	.000
Residual	1914	9476.865	4.951	
TOTAL	1920	312740.000		

**Significant at the .01 level of confidence

b_0= -33.857

b_1= 64.235

b_2= -35.494

b_3=8.303

b_4= -.669

R^2=.878

R=.937

TABLE 19

Polynomial Regression Analysis of CSU Fall Mean Attitude Toward Psychology Scores of Sections by Administration

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	42874.510	42874.510	91525.242**
b_1/b_0	1	2.386	2.386	5.093*
$b_2/b_1,b_0$	1	.202	.202	.432
$b_3/b_2,b_1,b_0$	1	.946	.946	2.019
Residual	51	23.891	.468	
TOTAL	55	42901.935		

**Significant at the .01 level of confidence

*Significant at the .05 level of confidence

$b_0=27.478$ $b_1=.147$

$R^2=.087$ $R=.295$

evidently had no differential effect on student attitude. The procedure of basing analyses on an entire class rather than partitioning by section was therefore considered justifiable.

Winter Quarter CSU Introductory Psychology

Mean scores based on the total N (297) of Attitude Toward Psychology, Attitude Toward the Course, and Achievement are listed in Table 20. The most striking feature of both mean attitude scores across administrations is the consistency. The only apparent change was a very slight drop in Attitude Toward the Course on the last administration. The achievement scores appear to form a negatively accelerated curve across administrations, with no evidence of a plateau such as the Fall CSU data reflected.

TABLE 20

Mean Winter CSU Attitude Toward Psychology, Attitude Toward the Course, and Achievement Scores by Administration (N=297)

	Administration				
Score	1	2	3	4	5
Attitude Psychology	28.73	28.30	28.41	28.42	28.56
Attitude Course	26.67	27.82	27.66	27.12	26.59
Achievement	2.60	8.24	12.31	16.20	19.84

The polynomial regression analysis of the CSU Winter Attitude Toward Psychology (Table 21) indicated that the best-fitting line was the mean line. No polynomial equation accounted for a significant amount of the total variation. These results reflect the

TABLE 21

Polynomial Regression Analysis of CSU Winter Attitude Toward Psychology Scores by Administration

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	11204795.154	11204795.154	87074.674**
b_1/b_0	1	1.172	1.172	.085
$b_2/b_1,b_0$	1	22.963	22.963	1.660
$b_3/b_2,b_1,b_0$	1	5.431	5.431	.392
$b_4/b_3,b_2,b_1,b_0$	1	3.327	3.327	.240
$b_5/b_4,b_3,b_2,b_1,b_0$	1	.000	.000	.000
Residual	1479	20463.953	13.836	
TOTAL	1485	11225292.000		

**Significant at the .01 level of confidence

b_0=28.543

R^2=.002 R=.040

TABLE 22

Polynomial Regression Analysis of CSU Winter Attitude Toward the Course Scores by Administration

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	1112413.964	1112413.964	29744.308**
b_1/b_0	1	243.839	243.839	6.520*
$b_2/b_1,b_0$	1	64.781	64.781	1.732
$b_3/b_2,b_1,b_0$	1	3.168	3.168	.085
$b_4/b_3,b_2,b_1,b_0$	1	.800	.800	.021
$b_5/b_4,b_3,b_2,b_1,b_0$	1	.000	.000	.000
Residual	1479	55313.448	37.399	
TOTAL	1485	1168040.000		

**Significant at the .01 level of confidence

*Significant at the .05 level of confidence

b_0=28.229 b_1= -.287

R^2=.004 R=.066

TABLE 23

Polynomial Regression Analysis of CSU Winter Achievement Scores by Administration

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	208095.112	208095.112	51592.435**
b_1/b_0	1	53496.978	53496.978	13263.355**
$b_2/b_1,b_0$	1	370.390	370.390	91.830**
$b_3/b_2,b_1,b_0$	1	52.534	52.534	13.025**
$b_4/b_3,b_2,b_1,b_0$	1	8.525	8.525	2.114
$b_5/b_4,b_3,b_2, b_1,b_0$	1	.000	.000	.000
Residual	1479	5965.461	4.033	
TOTAL	1485	267989.000		

**Significant at the .01 level of confidence

b_0= -4.846 b_1=8.650

b_2= -1.296 b_3=.111

R^2=.900 R=.949

previous observation that there was essentially no change in scale means across administrations. No relationship between Attitude Toward Psychology and time was indicated from the analysis.

The regression analysis on the CSU Winter Attitude Toward the Course scores over administrations yielded a significant linear equation describing a line which was declining slightly (Table 22). The declining Attitude Toward the Course is consistent with the results of the Fall CSU situation.

A third-degree equation fit the CSU Winter achievement data (Table 23), accounting for 90% of the total variation over time. Achievement appears to increase in this situation in a negatively accelerated curve. It is interesting to note that the arbitrary addition of five achievement items at each administration, linearly increasing the total possible score, did not force actual achievement scores into a linear form.

Missouri Introductory Psychology

Administration mean scores of Attitude Toward Psychology, Attitude Toward the Course, and Achievement are shown in Table 24.

TABLE 24

Mean Missouri Attitude Toward Psychology, Attitude Toward the Course, and Achievement Scores by Administration
(N=185)

	Administration				
Score	1	2	3	4	5
Attitude Psychology	27.34	27.77	27.03	27.28	27.16
Attitude Course	24.55	23.30	20.30	18.60	19.30
Achievement	4.11	6.43	9.38	12.25	17.50

Again, it can be noted that Attitude Toward Psychology changed very little over the five administrations. Attitude Toward the Course rather consistently declined with a slight increase on the fifth administration. Achievement increased in a positively accelerated manner. The first achievement score mean was 4.11 as opposed to the approximate 2.5 found in the other two learning situations. This reflects the fact that the first achievement score was corrected, by class section, to a mean of 2.5 on the basis of instructor-constructed tests in the CSU classes. The first Missouri mean achievement score was based on the raw scores on a five-item test selected from the special item pool. Evidently the items were relatively easy on this first test, resulting in the higher mean score.

As with the CSU Winter Attitude Toward Psychology scores, it was found that no polynomial equation resulted in a significant reduction of the total sum of squares in the Missouri Attitude Toward Psychology data (Table 25). The grand mean of the attitude scores was the best predictor of scores at any administration. There was essentially no change in Attitude Toward Psychology over the five attitude scale administrations.

A third-degree equation generated the best-fitting curve for the Missouri Attitude Toward the Course data (Table 26). Attitude Toward the Course was much more variable in the Missouri situation than in the other two learning situations where simple negative linear functions were found. It might be postulated that this phenomenon is related to the greater length of the semester course over the quarter system at CSU.

The Missouri Achievement scores (Table 27) formed a rather complex fourth-degree function, which adequately accounted for the total variation ($R^2 = .82$). It was expected that achievement over time would form more nearly a linear curve. However, it will be noticed that achievement in all three learning situations was a more complex function of time.

Curve Fitting. The curves described by the highest-degree equation which resulted in a significant reduction in the residual sum of squares in the preceding analyses were calculated for each variable in each situation. In order to plot the three variables by administration in each situation on the same coordinates for comparison, the predicted scores were converted to a percentage of total possible score. This was done so that the implication of comparable scale units between the two attitude scores and achievement scores would be avoided.

TABLE 25

Polynomial Regression Analysis of Missouri Attitude Toward Psychology Scores by Administration

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	690075.919	690075.919	53899.599**
b_1/b_0	1	13.494	13.494	1.054
$b_2/b_1, b_0$	1	.187	.187	.015
$b_3/b_2, b_1, b_0$	1	12.325	12.325	.963
$b_4/b_3, b_2, b_1, b_0$	1	33.129	33.129	2.588
$b_5/b_4, b_3, b_2, b_1, b_0$	1	.000	.000	.000
Residual	919	11765.946	12.803	
TOTAL	925	701901.000		

**Significant at the .01 level of confidence

b_0=27.570

TABLE 26

Polynomial Regression Analysis of Missouri Attitude Toward the Course Scores by Administration

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	416156.108	416156.108	10393.467**
b_1/b_0	1	4274.240	4274.240	106.749**
$b_2/b_1, b_0$	1	358.802	358.802	8.961**
$b_3/b_2, b_1, b_0$	1	319.655	319.655	7.983**
$b_4/b_3, b_2, b_1, b_0$	1	10.288	10.288	.257
$b_5/b_4, b_3, b_2, b_1, b_0$	1	.000	.000	.000
Residual	919	36796.908	40.040	
TOTAL	925	457916.000		

**Significant at the .01 level of confidence

b_0=22.557 b_1=4.422

b_2= -2.745 b_3=.346

R^2=.119 R=.344

TABLE 27

Polynomial Regression Analysis of Missouri Achievement Scores by Administration

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	91303.892	91303.892	18775.877**
b_1/b_0	1	19654.541	19654.541	4041.791**
$b_2/b_1,b_0$	1	440.395	440.395	90.564**
$b_3/b_2,b_1,b_0$	1	55.351	55.351	11.383**
$b_4/b_3,b_2,b_1,b_0$	1	26.880	26.880	5.528*
$b_5/b_4,b_3,b_2,b_1,b_0$	1	.000	.000	.000
Residual	919	4468.941	4.863	
TOTAL	925	115950.000		

**Significant at the .01 level of confidence

*Significant at the .05 level of confidence

$b_0=6.362$ $b_1= -6.633$

$b_2=5.702$ $b_3= -1.450$

$b_5=.133$ $R^2=.819$

$R=.905$

The three curves representing predicted scores for each variable are compared by learning situation in Figures 1, 2 and 3. Although equations for each particular variable differed somewhat from situation to situation, it will be noted that the resulting curves are very similar.

Achievement in all three situations rises in a nearly linear fashion, although the curves are represented by as high as a fourth-degree equation. Final achievement scores on the Missouri final examination were about 10% lower than scores on the two CSU final examinations.

Attitude Toward the Course dropped slightly over time in a linear manner in both CSU situations. A more sharply declining attitude was found in the Missouri class, with a slight rise from the fourth to fifth administrations. It is interesting to note that the Missouri achievement curve also changed to a steeper slope at the fourth administration, indicating a possible relationship between change in Attitude Toward the Course at this point and change in achievement. A similar change in the CSU Fall achievement curve was also found at the fourth administration, however, without an accompanying change in Attitude Toward the Course.

Attitude Toward Psychology was best described by a horizontal mean line in the CSU Winter and Missouri situations. A slightly rising linear function described this attitude change in the CSU Fall class. It is evident that, in the three learning situations studied, attitude toward the subject matter was not changed by participation in the learning situation.

With the single exception of one similar change in the achievement and Attitude Toward the Course curves in the Missouri situation, there appears to be no relationship between the general predicted curves for the three variables in any situation studied.

Other Interpretations of the Data

Product-moment correlation coefficients were calculated between each of the three variables at individual administrations (Table 28). For example, in the CSU Fall class, administration one, three correlation coefficients were calculated: Attitude Toward Psychology scores with Attitude Toward the Course scores; Attitude Toward Psychology scores with achievement scores; and Attitude Toward the Course scores with achievement scores.

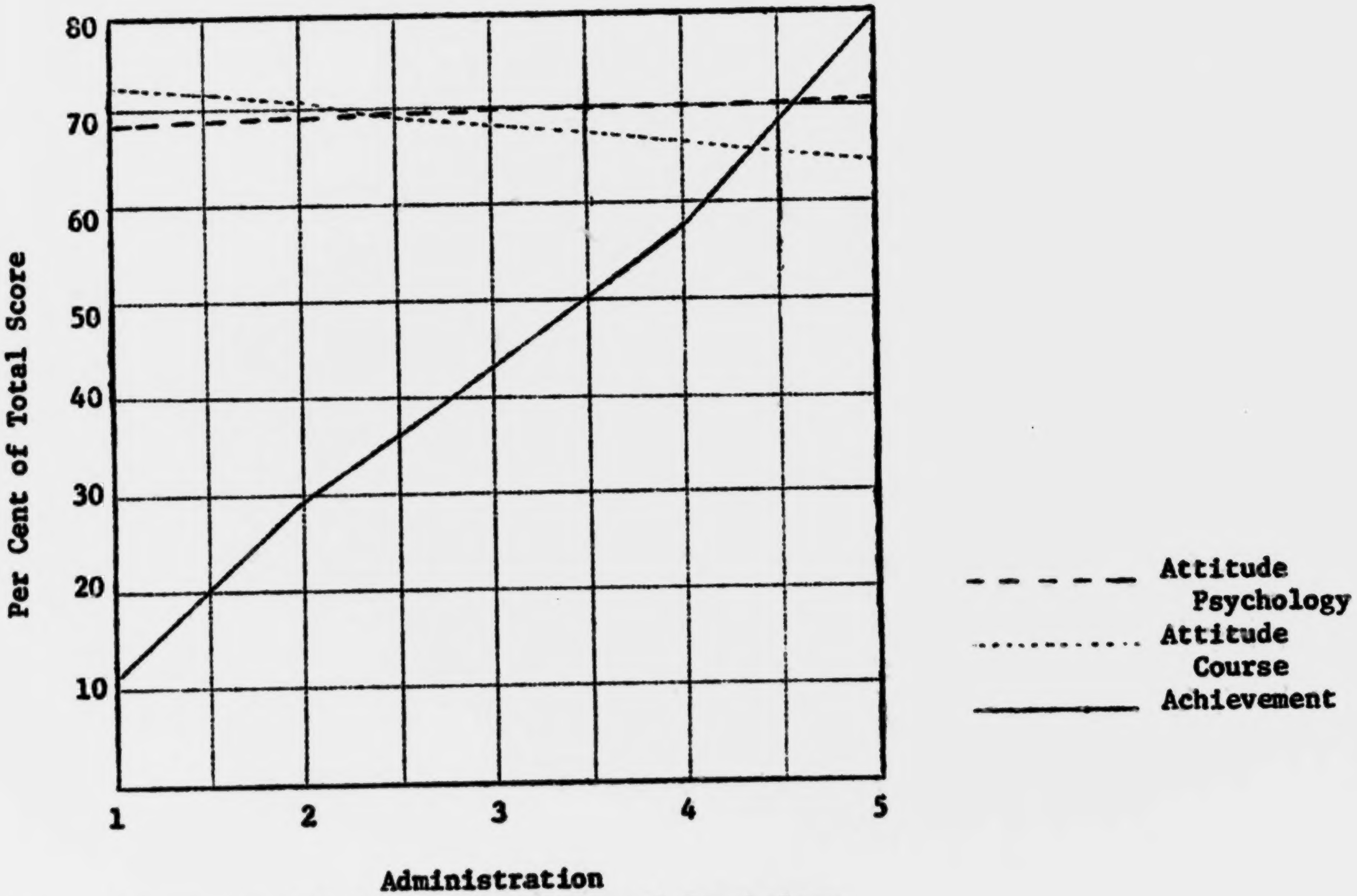

Figure 1. Curves for CSU Fall Attitude Toward Psychology, Attitude Toward the Course, and Achievement Scores.

2

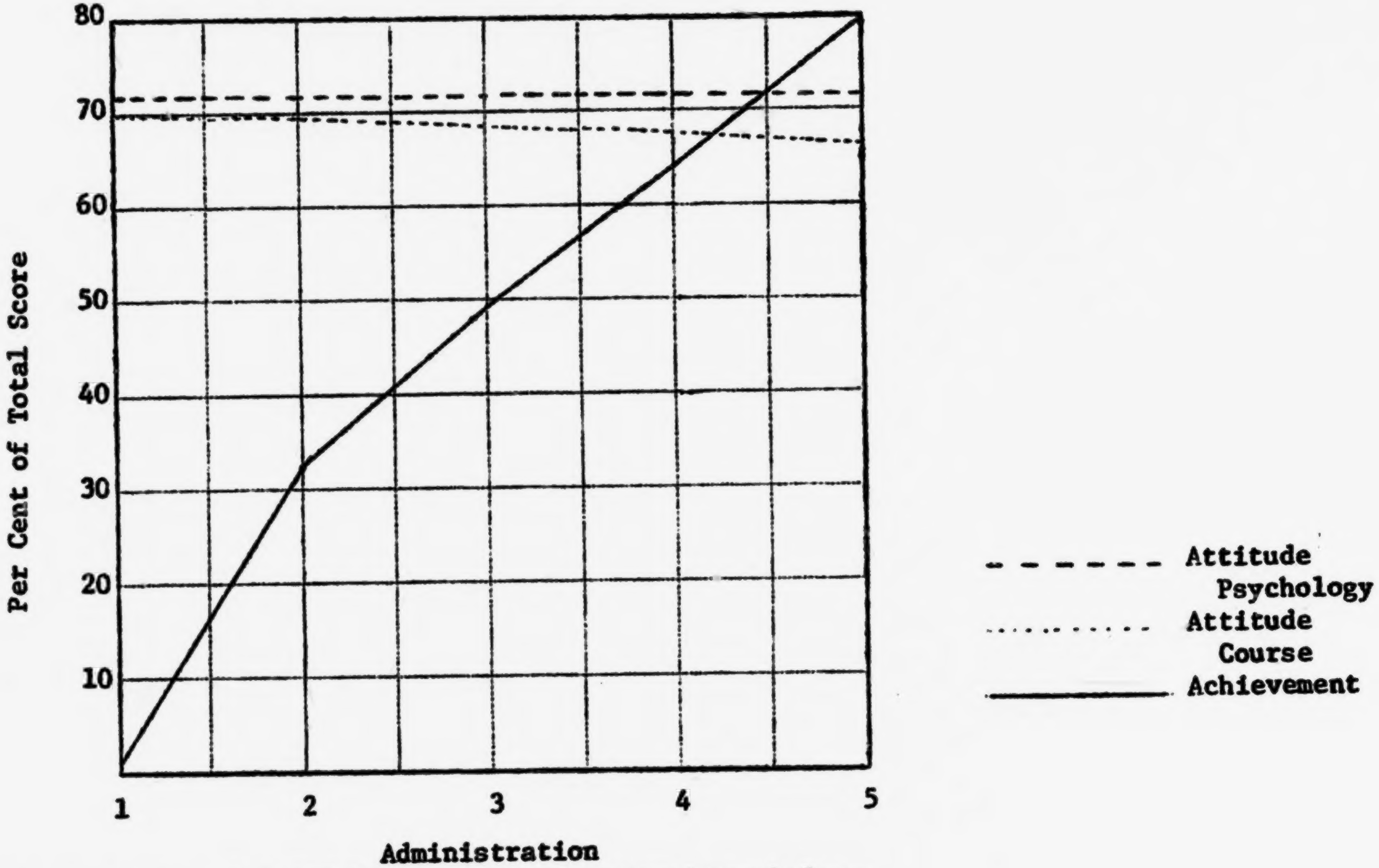

Figure 2. Curves for CSU Winter Attitude Toward Psychology, Attitude Toward the Course, and Achievement Scores.

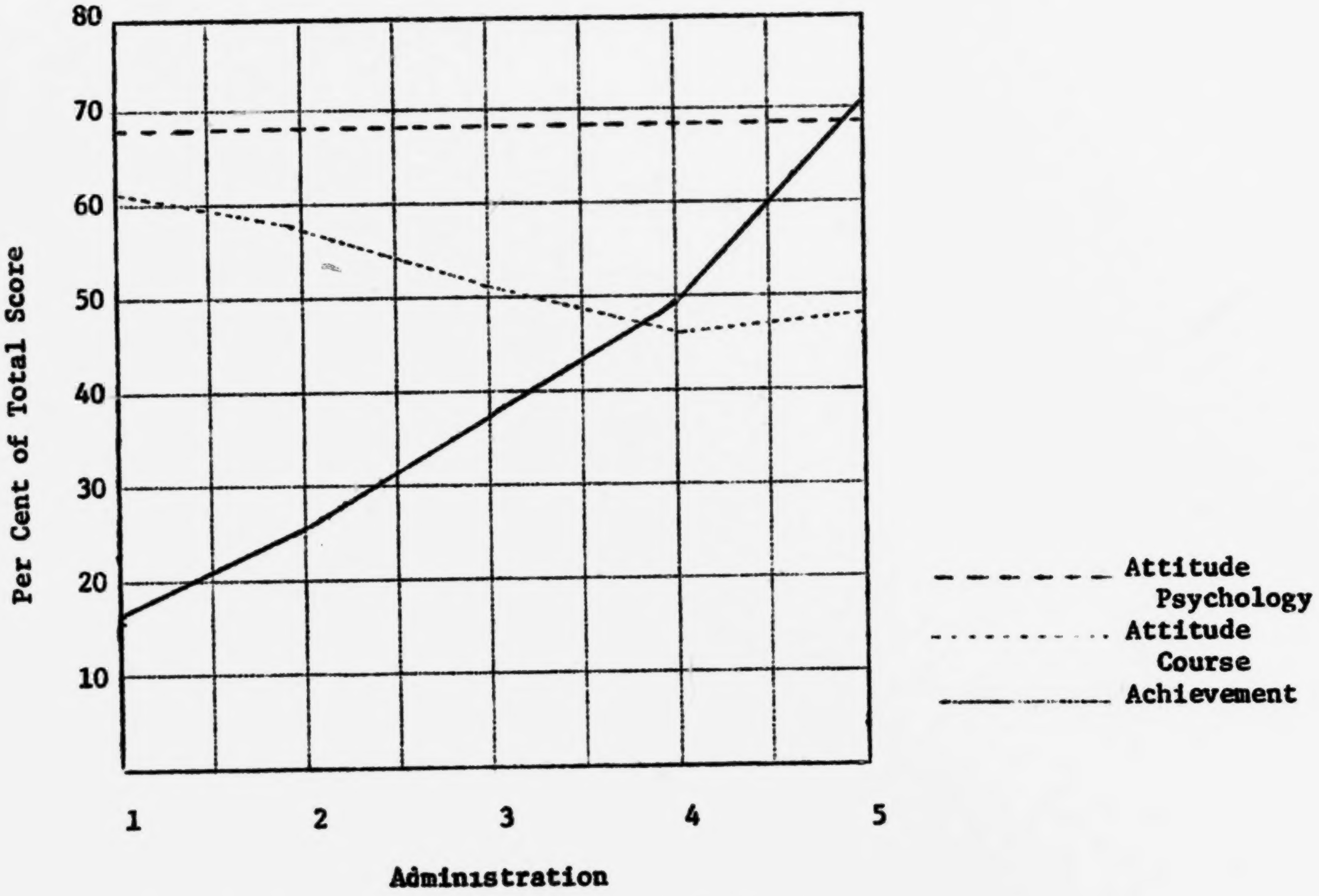

Figure 3. Curves for Missouri Attitude Toward Psychology, Attitude Toward the Course, and Achievement Scores.

TABLE 28

Zero-Order Correlation Coefficients Between Attitude Toward Psychology Scores, Attitude Toward the Course Scores, And Achievement Scores at the Same Administration

Situation	Variables Correlated	Administration 1	2	3	4	5
CSU Fall	Psych.-Course	.32	.37	.38	.33	.35
	Psych.-Ach.	.10	.22	.20	.27	.20
	Course-Ach.	.13	.23	.12	.15	.19
CSU Winter	Psych.-Course	.25	.28	.39	.24	.33
	Psych.-Ach.	.09	.08	.06	.06	.11
	Course-Ach.	.03	.10	-.02	-.02	.04
Missouri	Psych.-Course	.18	.19	.21	.21	.22
	Psych.-Ach.	.01	.18	.18	.06	.15
	Course-Ach.	-.04	.09	.00	.03	.23

No trends of increasing or decreasing relationships between any of the variables over time were evident. Attitude Toward the Course and Attitude Toward Psychology were consistently more highly related than either attitude measure was related to achievement. All of the variables were most highly interrelated in the CSU Fall situation. The only negative relatonships were three very slight correlations between Attitude Toward the Course and achievement. The only conclusion to be reached from an inspection of the same administration intercorrelations in Table 28 is that the affective variables appear quite independent of the cognitive variable.

Finally, following the generally held assumption that there must be some relationship between affective and cognitive teaching goals, it was decided to compare changes in achievement over time of individuals with specific patterns of change in Attitude Toward Psychology. Using the Winter CSU class as subjects, those individuals in the high and low 25% of the distribution of the fifth Attitude Toward Psychology scores were identified (N = 75). Within the high and low Attitude Toward Psychology$_5$ groups, the 50% of the students which were nearest the total class mean on the first Attitude Toward Psychology scale administration were identified. A group beginning near the class mean and exhibiting a rising Attitude Toward Psychology (N = 38) and a group beginning near the class mean and exhibiting a declining Attitude Toward Psychology (N = 38) were thus picked. Initial Attitude Toward Psychology scores ranged from 24-32 for the high group and from 26-30 for the low group.

If affective were related to cognitive learning, the achievement curves for these groups should have differed from each other and from the curve of the total CSU Winter class. Mean achievement scores for each administration were calculated and compared with the predicted means for the entire class. As can be seen from Table 29,

TABLE 29

Mean Achievement Scores by Administration of High and Low
Attitude Toward Psychology Groups Compared with
Predicted Mean Achievement for the CSU Winter Class

Group	1	2	3	4	5
High (N=38)	2.657	8.972	12.550	15.996	20.232
Predicted	2.619	8.158	12.437	16.122	19.879
Low (N=38)	2.657	8.077	11.945	15.812	19.259

the high, low, and predicted achievement means could hardly be closer if completely randomized groups had been drawn. There is a slight trend for the high Attitude group to have higher achievement than the low Attitude group, but the differences were not large enough to indicate any real relationship between affective and cognitive learning when the method of choosing the groups was considered.

Partial Correlations of Attitude Scores with Final Achievement

Regression Analysis. A multinomial regression analysis, explained earlier, was utilized to obtain the partial correlation between each individual attitude scale administration score and the final achievement score. The regression analysis assessed the contribution of each attitude scale administration to total criterion variation, yielding a multiple regression equation of the form:

$$\hat{Y} = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5$$

where b_0 is a constant correction for the mean, b_i is the regression coefficient, and X_i the respective attitude scale administration score. Each regression coefficient has an associated partial correlation coefficient which indicates the contribution of that variable to the multiple correlation independent of other variables in the regression equation.

The multinomial regression analyses of Attitude Toward Psychology scores and Attitude Toward the Course scores on final (fifth) achievement scores are shown in Tables 30 through 35. The most striking characteristic of all these analyses is the small proportion of total achievement variation which was accounted for by a regression system composed of either attitude score. Multiple correlations between Attitude Toward Psychology and the final achievement test were .211, .243, and .260, in the three situations, indicating a small but statistically significant relationship between affective and cognitive teaching objectives. The prediction system, composed of the five affective teaching objective variables, accounted for only approximately 6% of the final cognitive teaching objectives variation in any situation.

In the multinomial regression analyses of Attitude Toward the Course scores on final (fifth) achievement scores, the most striking characteristic of the analyses is again, the small proportion of criterion variance accounted for by the predictor variables; 1%, 5%, and 8% in the three classes. Multiple correlation coefficients between the five Attitude Toward the Course scores and fifth achievement scores in the three situations were .116, .226, and .283. There was considerably more variability evident in the relationship between Attitude Toward the Course and final achievement than between Attitude Toward Psychology and final achievement, indicating that factors associated with an individual class probably have differential effects on Attitude Toward the Course. Attitude toward the learning situation may be practically important in cognitive achievement in certain cases.

TABLE 30

Multinomial Regression Analysis of Five CSU Fall Attitude Toward Psychology Scores with Final Achievement

Source of[a] Variation	df	Sum of Squares	Mean Square	F[b]
b_0	1	149981.565	149981.565	18275.175**
b_1/b_0	1	64.840	64.840	7.901**
$b_2/b_1,b_0$	1	130.033	130.033	15.884**
$b_3/b_2,b_1,b_0$	1	27.520	27.520	3.353
$b_4/b_3,b_2,b_1,b_0$	1	2.450	2.450	.293
$b_5/b_4,b_3,b_2,b_1,b_0$	1	.449	.449	.055
Residual	378	3102.188	8.207	
TOTAL	384	153309.000		

**Significant at the .01 level of confidence

b_0=14.155 b_1= -.033

b_2=.128 b_3=.071

b_4=.021 b_5=.015

R^2=.068 R=.260

[a] The notation used: bi/bi-1,...b_0= regression due to b_i given that the sum of squares due to previous variables has been determined, where b_0= correction for the mean.

[b] The F-ratio tests the significance of bi from zero, or alternatively, the contribution of variable i to the multiple regression equation.

TABLE 31

Multinomial Regression Analysis of Five Fall CSU Attitude Toward the Course Scores with Final Achievement

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	149981.565	149981.565	17951.909**
b_1/b_0	1	51.204	51.204	6.129*
$b_2/b_1,b_0$	1	48.375	48.375	5.790*
$b_3/b_2,b_1,b_0$	1	63.018	63.018	7.543**
$b_4/b_3,b_2,b_1,b_0$	1	1.610	1.610	.193
$b_5/b_4,b_3,b_2,b_1,b_0$	1	5.177	5.177	.620
Residual	378	3158.050	8.355	
TOTAL	384	153308.999		

**Significant at the .01 level of confidence

*Significant at the .05 level of confidence

b_0=16.710 b_1= -.024

b_2=.013 b_3=.097

b_4= -.010 b_5=.037

R^2=.051 R=.226

TABLE 32

Multinomial Regression Analysis of Five CSU Winter Attitude Toward Psychology Scores with Final Achievement

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	116927.438	116927.438	17883.556**
b_1/b_0	1	30.665	30.665	4.690*
$b_2/b_1, b_0$	1	24.562	24.562	3.757
$b_3/b_2, b_1, b_0$	1	17.119	17.119	2.618
$b_4/b_3, b_2, b_1, b_0$	1	.011	.011	.002
$b_5/b_4, b_3, b_2, b_1, b_0$	1	16.569	16.569	2.534
Residual	291	1902.635	6.538	
TOTAL	297	118919.000		

**Significant at the .01 level of confidence

*Significant at the .05 level of confidence

b_0=18.069	b_1=.133
b_2= -.207	b_3=.072
b_4= -.033	b_5=.095
R^2=.045	R=.211

TABLE 33

Multinomial Regression Analysis of Five CSU Winter Attitude Toward the Course Scores with Final Achievement

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	116927.438	116927.438	17317.652**
b_1/b_0	1	.092	.092	.014
$b_2/b_1,b_0$	1	.123	.123	.018
$b_3/b_2,b_1,b_0$	1	22.657	22.657	3.356
$b_4/b_3,b_2,b_1,b_0$	1	3.465	3.465	.513
$b_5/b_4,b_3,b_2,b_1,b_0$	1	.415	.415	.061
Residual	291	1964.809	6.752	
TOTAL	297	118919.000		

**Significant at the .01 level of confidence

b_0=19.675 b_1= -.005

b_2= -.069 b_3=.051

b_4=.043 b_5= -.012

R^2=.013 R=.116

TABLE 34

Multinomial Regression Analysis of Five Missouri Attitude Toward Psychology Scores with Final Achievement

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	56638.751	56638.751	5316.695**
b_1/b_0	1	1.767	1.767	.166
$b_2/b_1,b_0$	1	64.630	64.630	6.067*
$b_3/b_2,b_1,b_0$	1	36.685	36.685	3.444
$b_4/b_3,b_2,b_1,b_0$	1	10.768	10.768	1.011
$b_5/b_4,b_3,b_2,b_1,b_0$	1	5.511	5.511	.517
Residual	179	1906.887	10.653	
TOTAL	185	58665.000		

**Significant at the .01 level of confidence

*Significant at the .05 level of confidence

b_0=13.204 b_1= -.183

b_2=.110 b_3=.097

b_4=.058 b_5=.076

R^2=.059 R=.243

TABLE 35

Multinomial Regression Analysis of Five Missouri Attitude Toward the Course Scores with Final Achievement

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	56638.751	56638.751	5439.003**
b_1/b_0	1	.490	.490	.047
$b_2/b_1,b_0$	1	41.678	41.678	4.002*
$b_3/b_2,b_1,b_0$	1	4.711	4.711	.452
$b_4/b_3,b_2,b_1,b_0$	1	13.374	13.374	1.284
$b_5/b_4,b_3,b_2,b_1,b_0$	1	101.990	101.990	9.794**
Residual	179	1864.006	10.413	
TOTAL	185	58665.000		

**Significant at the .01 level of confidence

*Significant at the .05 level of confidence

b_0=16.225 b_1= -.086

b_2=.040 b_3= -.026

b_4= -.097 b_5= .247

R^2=.080 R=.286

Partial Correlations. The partial correlation coefficients between each Attitude Toward Psychology administration score and final achievement in the three learning situations are listed in Tables 36, 37 and 38. The F-value associated with each coefficient indicates the statistical significance of that coefficient from zero. This F-value results from the regression analysis, where it is also utilized to test the significance resulting regression coefficient from zero.

In the CSU Fall situation the first two Attitude Toward Psychology scores correlated significantly with final achievement. The first administration score was negatively related to achievement, whereas the second attitude score was positive. There was apparently a sharp shift in attitude toward the subject matter in this class approximately between the second and fourth weeks of class. Following the first 50% of the course, Attitude Toward Psychology became progressively less closely related to final achievement.

Only the first Attitude Toward Psychology score was significantly related to final achievement in the CSU Winter situation. Interestingly, the correlation between attitude administration two and final achievement in this class was reversed in a negative direction, closely approaching statistical significance at the .05 level. This pattern was exactly opposite to the relationships found in the CSU Winter class. Coefficients between the third and fifth Attitude Toward Psychology scores were about the same (.09), but no relationship was found between administration four and final achievement.

In the Missouri course, only the second Attitude Toward Psychology score was significantly related to final achievement. Again a negative relationship, although very small, was found between administration one scores and final achievement. Following the second administration, correlation coefficients became progressively smaller to the fifth administration, with administration three approaching significance.

It is interesting to note that similar patterns of the changes in the relationship between Attitude Toward Psychology and final achievement were found in all three learning situations. In all cases, the partial correlation between the first or second Attitude Toward Psychology scores and final achievement reached statistical significance. These were the attitude measurements following the first 20% and 40% of the course. Also, in all cases there was a reversal in the direction of the relationship between Attitude

TABLE 36

Partial Correlation Coefficients of Five CSU Fall Attitude Toward Psychology Scores with Final Achievement Score

Administration	Coefficient[a]	F-Value[b]
1	-.139	7.901**
2	.199	15.844**
3	.094	3.353
4	.028	.293
5	.010	.055

**Significant at the .01 level of confidence

[a] The partial correlation coefficients were calculated sequentially beginning with a correction for the mean. Each coefficient reflects the correlation of the variable with criterion variation due previous variables controlled. The notation for any given partial correlation coefficient would thus be: ryi.i-1,···0, where 0 is the correction for the mean.

[b] F=1,378 df

TABLE 37

Partial Correlation Coefficients of Five CSU Winter Attitude Toward Psychology Scores with Final Achievement Score

Administration	Coefficient	F-Value[a]
1	.123	4.690*
2	-.112	3.757
3	.094	2.618
4	.000	.002
5	.093	2.534

* Significant at the .05 level of conficence

[a] F = 1,291 df

TABLE 38

Partial Correlation Coefficients of Five Missouri Attitude Toward Psychology Scores with Final Achievement Scores

Administration	Coefficient	F-Value[a]
1	-.03	.166
2	.179	6.067*
3	.137	3.444
4	.075	1.011
5	.054	.517

* Significant at the .05 level of confidence

[a] F = 1,179 df

Toward Psychology and final achievement between the first and second administration. Generally decreasing relationships between Attitude Toward Psychology and final achievement were found in all three situations at administrations three, four, and five, although the partial coefficient based on administration three data approached statistical significance in two of the classes. This pattern seems to indicate that final achievement variation attributable to attitude toward the subject matter is generally accounted for by the time approximately 40% of the course of instruction has taken place. Moreover, in the classes studied, there appears to be a general reversal of the relationship between attitude toward the subject matter and final achievement during the first 40% of a course of instruction.

Partial correlation coefficients between Attitude Toward the Course scores by administration and final achievement are shown in Tables 39, 40 and 41. No general pattern of changes in relationships between the variables was evident as for Attitude Toward Psychology. Only the CSU Fall course coefficients fit the Attitude Toward Psychology pattern of closer relationships between attitude during the first part of the course and final achievement with a reversal of the relationship between the first two administrations. None of the partial correlations were statistically significant in the CSU Winter situation, but the strongest relationship occurred at the third administration.

In the Missouri course, the second Attitude Toward the Course scores were significantly related to final achievement, following a very slight negative relationship between first administration scores and achievement. However, the final Attitude Toward the Course was also highly related to final achievement. This strong relationship between final Attitude Toward the Course and final achievement was reflected in similar changes in the curves describing these variables (Figure 3).

It appears that the changes in the relationships between attitude toward the learning situation and final achievement are more subject to the influence of situational characteristics than are changes in the relationships between attitude toward the subject matter and final achievement.

TABLE 39

Partial Correlation Coefficients of Five CSU Fall Attitude Toward the Course Scores with Final Anhievement Score

Administration	Coefficient	F-Value[a]
1	-.123	6.129*
2	.122	5.790*
3	.137	7.543**
4	-.023	.193
5	.040	.620

** Significant at the .01 level of confidence

* Significant at the .05 level of confidence

[a] F = 1,378 df

TABLE 40

Partial Correlation Coefficients of Five CSU Winter Attitude Toward the Course Scores with Final Achievement

Administration	Coefficient	F-Value[a]
1	.000	.014
2	.000	.018
3	.107	3.356
4	.042	.513
5	-.014	.061

[a] F = 1,291 df

TABLE 41

Partial Correlation Coefficients of Five Missouri Attitude Toward the Course Scores with Final Achievement Score

Administration	Coefficient	F-Value[a]
1	-.014	.047
2	.140	4.002*
3	-.049	.452
4	-.083	1.284
5	.228	9.794**

** Significant at the .01 level of confidence

* Significant at the .05 level of confidence

[a] F = 1,179

Pretest Sensitization

Data presented in the foregoing sections of this chapter have related to the general objective of the project concerned with the covariation of attitudes toward a course, attitudes taught as part of a course, and course achievement. The data presented in this section will relate to the second general objective of the project, i.e., pretest sensitization. It will be recalled that one of the specific objectives of the pretest sensitization aspect of this project related to learner involvement. This was to be assessed by measuring sensitization across three levels of involvement -- attitude toward the course (minimum involvement), attitudes taught as part of the course (partial involvement), and achievement (maximum involvement). Results from these analyses will be presented in the next section of the chapter. It will also be recalled that the relationship of initial test position to pretest sensitization was to be assessed by comparing changes in subsequent learner outcomes at different levels of the initial assessment. These data will be presented in the final sections of this chapter. Finally, evidence related to the interaction of involvement and pretest position will be discussed.

Involvement, CSU Fall Quarter Introductory Psychology. In Tables 42 through 50 are shown the results from analyses based on three levels of involvement of CSU Fall Quarter students of introductory psychology. From Tables 42 through 44 wherein minimum involvement is reported, it can be seen that those students whose attitudes were measured least frequently reflected least favorable scores as shown in the progressively increasing F-values from the second to the fifth administrations of the scales. In this analysis, scores of sections were considered rather than scores of total enrollees. The section comparisons comprise a more sensitive test of significance than if the pooled groups only had been compared. Whereas it would be predicted on the basis of previous theory that minimal involvement would produce no pretest sensitization, the opposite tendency is found (Table 44). In interpreting the two tables showing comparable analyses but with more involvement (Tables 47 and 50), it can be seen that no discernible pattern of sensitization exists.

Involvement, CSU Winter Quarter Introductory Psychology. Results for the varying degrees of involvement of CSU Winter Quarter students are shown in Tables 51 through 59. As in the case of the Fall Quarter, the attitudes measuring minimal involvement were significantly related to pretest sensitization but in the opposite direction (Table 53). The pattern for

TABLE 42

Mean Attitude Toward the Course Scores by Group and Administration CSU Fall Quarter

		Test Administration				
Group	N	1	2	3	4	5
I	36					22.25
II	37				25.16	24.22
III	29			26.79	25.21	23.93
IV	69		28.74	28.10	26.77	26.37
V	383	28.88	28.41	27.97	26.60	25.58
VI	26	27.12				25.42

TABLE 43

Means and Standard Deviations for Attitude Toward Course - CSU Fall Quarter

	TEST ADMINISTRATION									
	I		II		III		IV		V	
Group	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
13									22.25	7.21
10	27.12	5.24							25.42	6.34
6							25.16	6.89	24.22	6.11
4					26.79	5.87	25.21	6.29	23.93	6.08
3			28.58	4.53	28.76	3.74	26.73	4.30	26.48	4.40
5			28.89	5.73	27.50	5.83	26.81	6.71	26.28	7.32
1	31.68	4.42	29.91	5.46	30.24	5.02	30.00	4.39	29.09	4.96
2	28.56	4.80	27.79	5.57	29.15	4.20	26.79	6.13	25.59	6.63
7	29.07	4.68	28.53	4.02	28.00	4.73	26.87	5.29	26.50	6.25
8	27.40	4.75	27.91	4.86	27.14	4.92	25.46	6.39	25.00	7.06
9	28.17	5.26	28.20	5.18	26.89	6.43	24.17	6.03	23.23	6.35
11	28.89	5.14	27.81	6.36	28.27	5.42	27.89	5.42	26.11	6.04
12	31.14	4.35	31.73	4.61	31.59	4.34	30.19	5.71	29.41	5.16
14	27.68	5.94	27.08	5.56	26.05	6.84	24.86	6.29	22.73	6.95
15	29.08	4.58	28.64	4.16	27.33	5.03	26.94	4.68	25.58	4.85
16	28.09	6.04	26.91	5.82	26.06	4.37	24.09	6.40	23.82	4.57
17	27.90	4.74	27.93	5.54	26.53	5.12	25.00	6.80	24.23	7.14

TABLE 44

Analysis of Variance of Attitudes Toward
the Course Scores by Administration
CSU Fall Quarter

Administration	Source	Degrees of Freedom	Sum of Squares	Mean Square	F
2	Between	12	679.1	56.6	2.06*
	Within	439	12065.3	27.5	
3	Between	13	1183.8	91.1	3.36**
	Within	467	12662.4	27.1	
4	Between	14	1710.5	122.2	3.50**
	Within	503	17559.7	34.9	
5	Between	16	2203.4	137.7	3.63**
	Within	563	21361.2	37.9	

* Significant at the .05 level
** Significant at the .01 level

TABLE 45

Mean Attitude Toward Psychology Scores
by Group and Aministration
CSU Fall Quarter

		Test Aministration				
Group	N	1	2	3	4	5
I	36					28.08
II	37				28.00	28.11
III	29			28.76	28.62	28.45
IV	69		27.88	29.30	28.72	28.89
V	383	27.69	27.61	28.23	28.14	28.09
VI	26	27.38				27.31

TABLE 46

Means and Standard Deviations for
Attitude Toward Psychology
CSU Fall Quarter

	TEST ADMINISTRATION									
	I		II		III		IV		V	
Group	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
13									28.08	3.51
10	27.38	3.43							27.31	4.16
6							28.00	4.37	28.11	4.01
4					28.76	3.37	28.62	3.12	28.45	2.53
3			28.36	3.13	29.73	3.50	28.61	3.61	28.67	3.49
5			27.44	3.94	28.92	3.18	28.83	4.00	29.11	3.67
1	28.85	4.20	28.03	4.89	29.26	4.71	28.09	4.67	28.41	4.41
2	27.82	3.20	27.59	2.90	28.82	3.76	28.36	3.77	28.54	3.39
7	27.70	3.45	27.73	3.75	27.93	3.93	28.33	4.08	29.07	4.53
8	26.43	5.28	27.20	4.18	27.23	4.43	26.91	4.26	27.29	4.52
9	27.17	3.31	26.69	3.10	27.43	3.65	27.94	4.72	26.91	3.79
11	28.00	2.72	26.84	2.96	28.70	3.61	28.41	4.17	28.51	4.50
12	28.35	3.70	28.24	3.94	28.43	3.92	28.68	3.33	28.73	3.76
14	28.11	3.03	27.19	2.71	28.08	2.94	28.19	2.60	27.43	3.17
15	27.81	3.38	28.42	3.87	28.58	4.33	29.11	3.93	28.97	3.72
16	26.39	3.85	27.03	3.62	27.91	4.11	27.06	3.41	27.21	3.37
17	27.90	3.89	27.20	3.44	28.10	3.23	28.40	3.78	27.90	4.05

TABLE 47

Analysis of Variance of Attitude Toward Psychology Scores by Administration CSU Fall Quarter

Administration	Source	Degrees of Freedom	Sum of Squares	Mean Square	F
2	Between	12	142.5	11.9	0.92
	Within	439	5717.9	13.0	
3	Between	13	210.3	16.2	1.13
	Within	467	6735.2	14.4	
4	Between	14	171.7	12.3	0.81
	Within	503	7646.1	15.2	
5	Between	16	267.8	16.7	1.14
	Within	563	8258.3	14.7	

TABLE 48

Mean Achievement Scores
by Group and Administration
CSU Fall Quarter

		Test Administration				
Group	N	1	2	3	4	5
I	36					19.69
II	37				14.54	18.27
III	29			9.72	15.62	20.83
IV	69		8.39	8.79	15.00	19.01
V	383	2.53	8.37	9.44	15.36	19.81
VI	26	2.65				19.00

TABLE 49

Means and Standard Deviations for Achievement CSU - Fall Quarter

	TEST ADMINISTRATION									
	I		II		III		IV		V	
Group	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
13									19.69	3.01
10	2.65	1.02							19.00	3.02
6							14.54	2.57	18.27	2.98
4					9.72	1.87	15.62	1.88	20.83	2.24
3			8.48	1.33	9.27	2.21	14.97	3.07	19.48	2.71
5			8.31	1.28	8.36	2.22	15.03	1.73	18.58	2.78
1	2.59	.89	8.82	1.06	9.32	2.10	15.62	2.00	19.82	2.49
2	2.59	1.12	8.38	1.80	9.46	2.55	14.90	3.63	20.41	2.94
7	2.63	.96	8.40	1.28	10.00	2.24	15.27	3.38	19.67	2.16
8	2.49	1.04	8.20	1.32	9.37	2.06	14.83	2.98	19.06	3.34
9	2.57	.95	8.37	1.24	8.69	2.30	14.46	3.01	19.11	2.94
11	2.41	.90	8.35	1.18	9.62	1.95	15.35	2.45	19.35	2.33
12	2.68	1.03	8.54	1.12	8.97	2.53	16.05	2.49	20.57	2.75
14	2.62	1.04	7.84	1.28	9.14	2.38	15.38	1.93	19.84	3.07
15	2.42	.94	8.42	1.27	10.53	1.83	16.25	1.71	20.36	2.54
16	2.27	1.01	8.39	1.03	9.24	2.53	15.33	2.39	19.58	2.76
17	2.57	1.10	8.50	1.01	9.67	2.25	15.53	2.05	19.37	2.79

TABLE 50

Analysis of Variance of Achievement Scores
by Administration
CSU Fall Quarter

Administration	Source	Degrees of Freedom	Sum of Squares	Mean Square	F
2	Between	12	20.9	1.7	1.06
	Within	439	707.6	1.6	
3	Between	13	130.9	10.1	2.02*
	Within	467	2349.2	5.0	
4	Between	14	128.0	9.1	1.38
	Within	503	3297.7	6.6	
5	Between	16	265.9	16.6	2.16**
	Within	563	4353.7	7.7	

*Significant at the .05 level
**Significant at the .01 level

TABLE 51

Mean Attitude Toward the Course Scores
by Group and Administration
CSU Winter Quarter

		Test Administration				
Group	N	1	2	3	4	5
I	34					24.65
II	36				26.06	25.53
III	37			27.54	27.78	28.03
IV	26		27.23	26.23	25.15	25.31
V	297	27.66	27.94	27.65	27.11	26.58
VI	32	25.63				25.28

TABLE 52

Means and Standard Deviations for Attitude Toward the Course - CSU Fall Quarter

	TEST ADMINISTRATION									
	I		II		III		IV		V	
Group	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
6									24.65	7.10
14	25.63	6.40							25.28	7.01
17							26.06	6.47	25.53	6.42
20					27.54	5.48	27.78	5.41	28.03	5.13
16			27.23	6.49	26.23	6.43	25.15	5.97	25.31	5.13
1	26.00	6.41	27.46	4.59	26.83	5.96	24.88	4.98	24.00	5.41
2	27.21	4.33	26.59	4.29	25.62	5.11	26.14	4.57	25.76	4.09
4	23.94	5.78	24.84	6.82	23.81	6.67	23.42	6.51	22.23	6.84
5	28.31	5.12	28.52	5.55	29.38	5.32	28.48	5.20	27.55	5.61
10	24.19	5.47	25.76	5.76	26.33	6.75	25.21	6.44	24.62	6.34
19	28.65	5.82	28.01	5.64	27.70	6.32	27.50	5.88	27.27	5.51
21	31.58	5.57	31.09	5.07	30.89	5.96	30.60	5.65	30.45	6.10

TABLE 53

Analysis of Variance of Attitudes Toward the Course Scores by Administration CSU Winter Quarter

Administration	Source	Degrees of Freedom	Sum of Squares	Mean Square	F
2	Between	7	1121.1	160.2	5.17**
	Within	315			
3	Between	8	1418.7	177.3	4.84**
	Within	351	12858.7	36.6	
4	Between	9	1626.8	180.8	5.41**
	Within	386	12886.4	33.4	
5	Between	11	2136.5	194.2	5.49**
	Within	450	15945.0	35.4	

** Significant at the .01 level

TABLE 54

Mean Attitude Toward Psychology Scores
by Group and Administration
CSU Winter Quarter

		Test Administration				
Group	N	1	2	3	4	5
I	34					30.12
II	36				28.08	28.11
III	37			28.22	28.22	28.92
IV	26		27.88	27.04	26.88	27.19
V	297	28.72	28.29	28.41	28.42	28.56
VI	32	29.00				30.03

TABLE 55

Means and Standard Deviations for Attitude
Toward Psychology - CSU
Fall Quarter

TEST ADMINISTRATION

	I		II		III		IV		V	
Group	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
6									30.12	3.90
14	29.00	3.55							30.03	3.57
17							28.08	3.86	28.11	4.25
20					28.22	3.10	28.22	3.72	28.92	4.15
16			27.88	4.19	27.04	4.18	26.88	3.97	27.19	4.81
1	29.58	4.04	29.33	3.61	29.21	3.86	29.21	3.34	29.00	3.43
2	28.66	3.20	27.93	2.84	27.69	3.19	28.17	2.54	28.21	2.99
4	28.19	4.05	28.29	3.30	28.13	3.38	28.32	3.62	28.35	3.79
5	28.67	3.73	28.69	3.45	29.76	3.96	29.90	3.84	29.38	3.79
10	27.55	3.23	27.60	3.32	27.07	3.08	26.55	4.54	26.98	3.93
19	28.85	3.45	27.85	3.00	27.93	3.38	28.09	3.62	28.16	3.92
21	29.47	3.99	28.85	3.91	29.24	4.03	29.02	4.00	29.80	4.77

TABLE 56

Analysis of Variance of Attitude Toward Psychology Scores by Administration CSU Winter Quarter

Administration	Source	Degrees of Freedom	Sum of Squares	Mean Square	F
2	Between	7	92.6	13.2	1.12
	Within	315	3711.6	11.8	
3	Between	8	284.4	35.6	2.78**
	Within	351	4494.0	12.8	
4	Between	9	342.6	38.1	2.66**
	Within	386	5515.9	14.3	
5	Between	11	443.4	40.3	2.50**
	Within	450	7252.6	16.1	

** Significant at the .01 level

TABLE 57

Mean Achievement Scores
by Group and Administration
CSU Winter Quarter

		Test Administration				
Group	N	1	2	3	4	5
I	34					19.59
II	36				15.89	19.94
III	37			11.97	16.00	19.89
IV	26		8.04	11.50	15.35	19.38
V	297	2.60	8.24	12.31	16.19	19.84
VI	32	2.75				21.00

TABLE 58

Means and Standard Deviations for Achievement - CSU Fall Quarter

TEST ADMINISTRATION

	I		II		III		IV		V	
Group	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
6									19.59	3.30
14	2.75	1.08							21.00	1.85
17							15.89	2.54	19.94	2.47
20					11.97	2.44	16.00	3.22	19.89	2.48
16			8.04	1.46	11.50	3.47	15.35	3.26	19.38	2.65
1	2.71	.91	8.71	.86	12.67	1.24	16.54	2.40	20.08	2.65
2	2.66	.94	7.90	1.32	12.45	1.59	16.38	2.23	20.07	2.98
4	2.55	.77	8.26	1.34	12.45	2.01	15.81	3.39	19.26	3.09
5	2.60	1.19	8.24	1.21	12.81	1.85	16.07	2.48	19.57	2.55
10	2.67	.98	7.79	1.59	12.31	1.97	16.31	2.64	20.10	2.36
19	2.64	.85	8.22	1.19	11.82	2.06	16.19	2.38	19.74	2.48
21	2.45	.94	8.58	1.29	12.29	2.17	16.16	3.09	20.09	2.47

TABLE 59

Analysis of Variance of Achievement Scores
by Administration
CSU Winter Quarter

Administration	Source	Degrees of Freedom	Sum of Squares	Mean Square	F
2	Between	7	24.8	3.5	2.06*
	Within	315	527.2	1.7	
3	Between	8	50.5	6.3	1.37
	Within	351	1607.2	4.6	
4	Between	9	29.0	3.2	0.42
	Within	386	2944.5	7.6	
5	Between	11	73.4	6.7	0.99
	Within	450	3044.0	6.8	

* Significant at the .05 level

partial involvement (Table 56) is irregular and the pattern for maximal involvement (Table 59) shows that the more often the students were tested the more similar were their scores. In terms of achievement, little evidence of pretest sensitization can be discerned.

Involvement, University of Missouri Spring Semester Introductory Psychology Students. In Tables 60 through 68 are shown the results of the involvement analyses for the University of Missouri Spring Semester introductory psychology students. Inspection of these data indicates no significant pattern for pretest sensitization evidence for minimal involvement (Table 62), for partial involvement (Table 65) or for maximum involvement (Table 68).

Summary of Involvement. Results of analyzing pretest sensitization evidence in relation to learner involvement in two of the three situations studied refuted the hypothesis that the greater the involvement of the learner the greater the sensitization from pretesting. In the two situations mentioned, the data were in the opposite direction from that predicted by the hypothesis. This finding suggests that where there is substantial deviation from the mean line of assessment at the time of the initial measurement, considerable regression toward the mean is likely and this may account for the pretest sensitization sometimes found in repeated measurements designs. On the other hand, where there is only a minor deviation at the time of the initial measurement, regression as well as evidence of pretest sensitization are likely to be less. Additional evidence on this point is contained in the next section.

Initial Position

To assess the relationship of initial position to pretest sensitization, the distribution for each variable in each learning situation was divided into three parts -- the upper 30%, the middle 40% and the lower 30%. Equations were then solved to fit the appropriate line to the upper (top) group data and to the lower (bottom) group data. The index of correlation for each group was then computed as previously discussed. In each instance the lines were plotted graphically for the top and bottom groups.

Attitude Toward the Course. In Tables 69 through 74 are shown the results from fitting appropriate lines to the top and bottom groups for Attitude Toward the Course scores in the three situations. In the Fall and Winter CSU classes, the top group's

TABLE 60

Mean Attitude Toward the Course Scores by Group and Administration U of M Spring Semester

		Test Administration				
Group	N	1	2	3	4	5
I	26					20.96
II	23				18.39	19.48
III	21			23.91	20.95	21.33
IV	23		23.00	20.17	18.65	20.39
V	185	24.55	23.30	20.30	18.60	19.31
VI	43	23.46				19.98

TABLE 61

Means and Standard Deviations for
Attitude Toward the Course - CSU
Fall Quarter

	TEST ADMINISTRATION									
	I		II		III		IV		V	
Group	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
14									20.96	8.32
31	22.04	5.39							19.87	4.99
4	25.16	4.98							20.11	5.21
25							18.39	6.85	19.48	6.75
19					23.91	5.38	20.95	5.91	21.33	7.33
1			23.00	6.97	20.17	7.24	18.65	6.80	20.39	5.91
6	22.50	7.05	21.59	6.65	18.27	7.59	17.77	7.30	16.96	7.17
17	23.92	4.60	23.52	4.99	20.32	5.75	17.64	6.58	18.84	5.48
33	23.55	4.48	22.30	4.39	21.65	5.94	18.50	5.67	20.10	6.47
32	25.30	5.13	24.26	5.86	22.78	5.42	20.04	6.29	20.09	6.35
18	24.45	5.54	23.73	6.49	19.68	6.07	19.82	6.15	20.55	5.44
23	25.32	5.54	24.41	6.13	21.32	7.38	20.36	6.12	20.73	4.41
7	25.83	7.78	23.46	8.58	18.88	8.90	16.38	8.82	18.38	8.36
22	25.22	4.87	23.04	5.85	19.74	5.63	18.56	6.03	19.04	5.80

TABLE 62

Analysis of Variance of Attitudes Toward the Course Scores by Administration U of M Spring Semester

Administration	Source	Degrees of Freedom	Sum of Squares	Mean Square	F
2	Between	8	142.1	17.8	.44
	Within	199	7970.8	40.1	
3	Between	9	607.5	67.5	1.54
	Within	219	9614.7	43.9	
4	Between	10	414.9	41.5	.94
	Within	241	10700.1	44.4	
5	Between	13	396.3	30.5	.74
	Within	307	12625.8	41.1	

TABLE 63

Mean Attitude Toward Psychology Scores
by Group and Administration
U of M Spring Semester

		Test Administration				
Group	N	1	2	3	4	5
I	26					27.73
II	23				28.04	27.52
III	21			28.57	28.43	28.33
IV	23		28.52	28.26	27.96	27.70
V	185	27.34	27.77	27.03	27.28	27.16
VI	43	26.95				26.65

TABLE 64

Means and Standard Deviations by Administration for Attitude Toward Psychology - CSU
Fall Quarter

TEST ADMINISTRATION

	I		II		III		IV		V	
Group	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
14									27.73	3.61
31	27.25	3.62							26.67	3.52
4	26.58	3.60							26.63	4.07
25							28.04	3.05	27.52	4.27
19					28.57	3.34	28.43	3.71	28.33	3.14
1			28.52	3.23	28.26	3.24	27.96	2.77	27.78	2.70
6	27.14	2.85	27.23	3.64	26.59	3.88	26.86	3.91	27.23	3.15
17	28.16	3.84	27.80	2.61	27.96	2.72	27.08	3.16	27.36	3.23
33	27.95	4.51	28.15	2.52	26.00	4.91	27.95	2.76	27.25	2.67
32	27.39	4.60	27.35	3.23	26.65	3.81	27.96	3.48	27.13	3.65
18	26.86	3.11	27.46	3.58	26.27	3.15	26.14	2.75	25.91	3.56
23	27.00	3.04	28.23	3.68	27.36	3.69	26.77	4.19	27.59	3.80
7	26.63	5.08	27.54	4.81	26.68	3.23	27.00	3.20	26.38	3.35
22	27.52	3.22	28.37	3.63	28.26	3.72	28.30	3.46	28.22	4.07

TABLE 65

Analysis of Variance of Attitude Toward Psychology Scores by Administration U of M Spring Semester

Administration	Source	Degrees of Freedom	Sum of Squares	Mean Square	F
2	Between	8	42.7	5.3	.43
	Within	199	2449.0	12.3	
3	Between	9	178.4	19.8	1.54
	Within	219	2815.0	12.9	
4	Between	10	127.5	12.8	1.14
	Within	241	2695.5	11.2	
5	Between	13	138.8	10.7	.86
	Within	307	3811.5	12.4	

TABLE 66

Mean Achievement Scores
by Group and Administration
U of M Spring Semester

		Test Administration				
Group	N	1	2	3	4	5
I	26					17.58
II	23				12.87	18.30
III	21			9.19	12.62	17.48
IV	23		6.30	9.17	13.30	18.48
V	185	4.11	6.43	9.38	12.25	17.50
VI	43	3.75				17.28

TABLE 67

Means and Standard Deviations by Administration for Achievement Tests

	Test Administration									
	I		II		III		IV		V	
Group	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
14									17.58	3.78
31	3.92	1.14							17.08	2.81
4	3.53	1.47							17.53	3.78
25							12.87	2.65	18.30	3.88
19					9.19	1.97	12.62	2.50	17.48	3.01
1			6.30	1.74	9.17	2.08	13.30	3.08	18.48	2.91
6	4.18	.80	5.86	1.04	10.00	1.72	12.18	2.46	16.55	4.18
17	4.00	1.00	6.08	1.26	9.12	2.15	11.92	2.66	17.00	3.34
33	4.10	.72	6.95	1.54	9.80	1.94	11.70	2.58	17.65	3.18
32	4.04	1.07	6.39	1.20	8.57	2.09	12.17	2.67	16.91	3.30
18	4.00	.82	6.32	1.46	8.73	2.05	11.36	2.59	16.73	3.06
23	4.23	.81	6.41	1.44	9.64	1.53	13.59	2.22	18.64	3.13
7	4.33	.64	6.88	1.30	9.83	1.47	12.13	2.17	18.71	2.56
22	4.04	1.02	6.56	1.81	9.44	2.33	12.85	2.87	17.74	3.36

TABLE 68

Analysis of Variance of Achievement Scores
by Administration
U of M Spring Semester

Administration	Source	Degrees of Freedom	Sum of Squares	Mean Square	F
	Between	8	21.3	2.7	1.29
2	Within	199	415.1	2.1	
	Between	9	46.2	5.1	1.34
3	Within	219	839.5	3.8	
	Between	10	104.5	10.5	1.54
4	Within	241	1635.5	6.8	
	Between	13	150.9	11.6	1.05
5	Within	307	3406.1	11.1	

TABLE 69

Adjusted Linear, Quadratic and Cubic Regression for Attitude Toward the Course Scores Top Group--CSU-Fall Quarter

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	572403.76	572403.76	34798.57**
b_1/b_0	1	1838.36	1838.36	111.76**
$b_2/b_0,b_1$	1	47.31	47.31	2.88
$b_3/b_0,b_1,b_2$	1	.15	.15	.009
Residual	571	9392.41	16.45	
Total	575	583682.00		

**Significant at the .01 level

$R^2 = .163$, $R = .404$

$b_0 = 35.344$ Beta 1 -1.264

TABLE 70

Adjusted Linear, Quadratic and Cubic Regression for Attitude Toward the Course Scores Bottom Group--CSU-Fall Quarter

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	29678.64	296768.64	10301.31**
b_1/b_0	1	268.81	268.81	9.33**
$b_2/b_0,b_1$	1	217.68	217.68	7.56**
$b_3/b_0,b_1,b_2$	1	14.03	14.03	.49
Residual	571	16449.84	28.81	
Total	575	313719.00		

**Significant at the .01 level

R^2 = .029, R = .169

b_0 = 21.595 Beta 1 1.723 Beta 2 -.368

TABLE 71

Adjusted Linear, Quadratic and Cubic Regression
for Attitude Toward the Course Scores
Top Group--CSU-Winter Quarter

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	463844.25	463844.25	27065.05**
b_1/b_0	1	704.79	704.79	41.12**
$b_2/b_0,b_1$	1	10.43	10.43	.61
$b_3/b_0,b_1,b_2$	1	25.62	25.62	1.50
Residual	441	7557.92	17.14	
Total	445	472143.00		

**Significant at the .01 level

R^2=.085, R=.291

b_0=34.955 Beta 1 -.890

TABLE 72

Adjusted Linear, Quadratic and Cubic Regression for Attitude Toward the Course Scores Bottom Group--CSU-Winter Quarter

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	218825.67	218825.67	6286.72**
b_1/b_0	1	58.41	58.41	1.68
$b_2/b_0,b_1$	1	235.77	235.77	6.77**
$b_3/b_0,b_1,b_2$	1	36.00	36.00	1.03
Residual	441	15350.15	34.81	
Total	445	234506.00		

** Significant at the .01 level
R^2 =.019, R = .137
b_0 = 18.362 Beta 1 2.866 Beta 2 -.435

TABLE 73

Adjusted Linear, Quadratic and Cubic Regression
for Attitude Toward the Course Scores
Top Group--U of M

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	188142.72	188142.72	7557.59**
b_1/b_0	1	2358.77	2358.77	94.75**
$b_2/b_0,b_1$	1	176.83	176.83	7.10**
$b_3/b_0,b_1,b_2$	1	64.26	64.26	2.58
Residual	271	6746.42	24.90	
Total	275	197489.00		

** Significant at the .01 level

$R^2 = .271$, $R = .521$

$b_0 = 35.724$ Beta 1 -4.946   Beta 2 .479

TABLE 74

Adjusted Linear, Quadratic and Cubic Regression for Attitude Toward the Course Scores Bottom Group--U of M

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	73440.13	73440.13	2201.33**
b_1/b_0	1	352.00	352.00	10.55**
$b_2/b_0,b_1$	1	36.66	36.66	1.10
$b_3/b_0,b_1,b_2$	1	186.18	186.18	5.58*
Residual	271	9041.03	33.36	
Total	275	83056.00		

** Significant at the .01 level

* Significant at the .05 level

$R^2 = .060$, $R = .244$

$b_0 = 12.124$ Beta 1 9.333 Beta 2 -4.145

Beta 3 .485

change in attitude toward the course was characterized by a straight line sloping gradually toward the mean for the total group. The bottom group was characterized by a slight curve, rising gradually during the first half of the course and then falling gradually during the second half. These changes are shown in Figures 4 and 5. In the University of Missouri situation the bottom group tended to be considerably more variable. This group moved upward toward the mean rapidly, then became less favorable near the middle of the course, then changed in the direction of the mean toward the end (Figure 6).

The net change between the first and last administrations of the Attitude Toward the Course scales and the parallel standard deviation change for both groups are shown in Table 75. From inspection of Table 75 it is apparent that the greatest change occurred in the top group in relation to the bottom group in all instances. The changes in the middle group have been included in Table 75 for comparison purposes only, but confirm the pattern of changes in that the middle group changes lie between the top and bottom groups.

In Tables 76 through 81 and Figures 7 through 9 are shown the Changes in Attitude Toward Psychology scores for the top and bottom 30% of the distribution within each situation. In contrast to the Attitude Toward the Course data, the top group showed somewhat more variability than that shown in the Attitude Toward Course data, but the general pattern is similar. In all instances there was a tendency for the upper group to move downward toward the mean and for bottom groups to reflect a slight curve, but with less consistency than for the data in the previous analyses. The net changes in Table 82 also reflect the inconsistency, but a tendency for those in the bottom group to become more favorable can be noted.

In Tables 83 through 89 the changes in achievement are shown. From these data it can be seen that by employing a second or third order equation to characterize the data, an extremely close fit was accomplished. In all situations, both the top and bottom groups showed a steady progression toward increased achievement with a highly consistent pattern. The lines for the equations have been plotted in Figures 10, 11 and 12. The consistency reflected in the two groups in each situation is readily apparent.

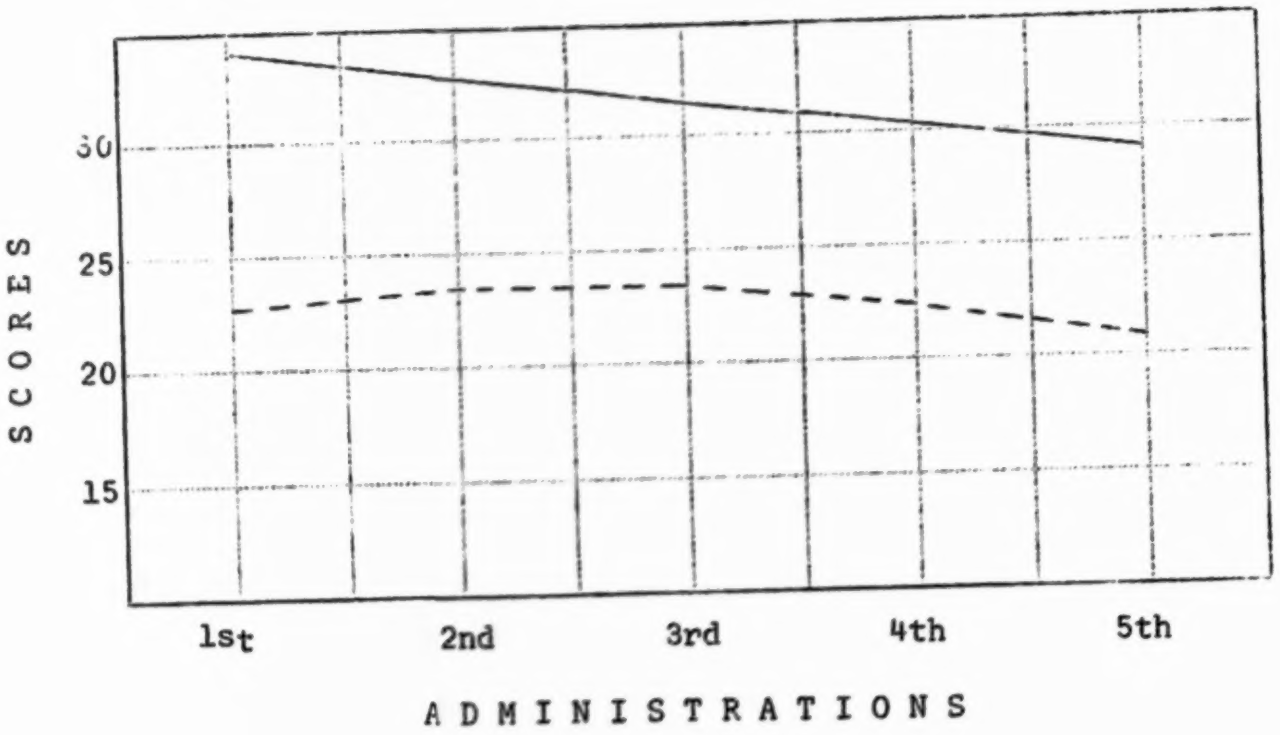

Figure 4. Changes in Attitude Toward Course Scores, Top and Bottom Groups, CSU Fall Quarter

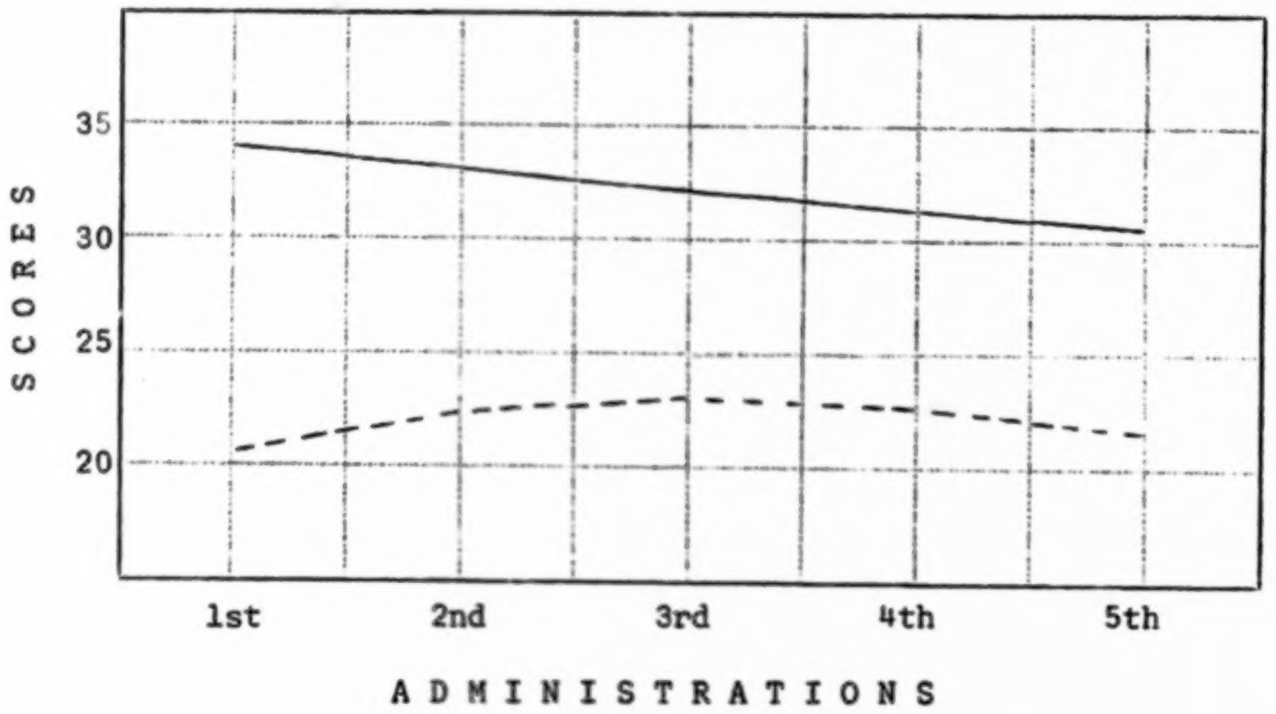

Figure 5. Changes in Attitude Toward Course Scores, Top and Bottom Groups, CSU Winter Quarter

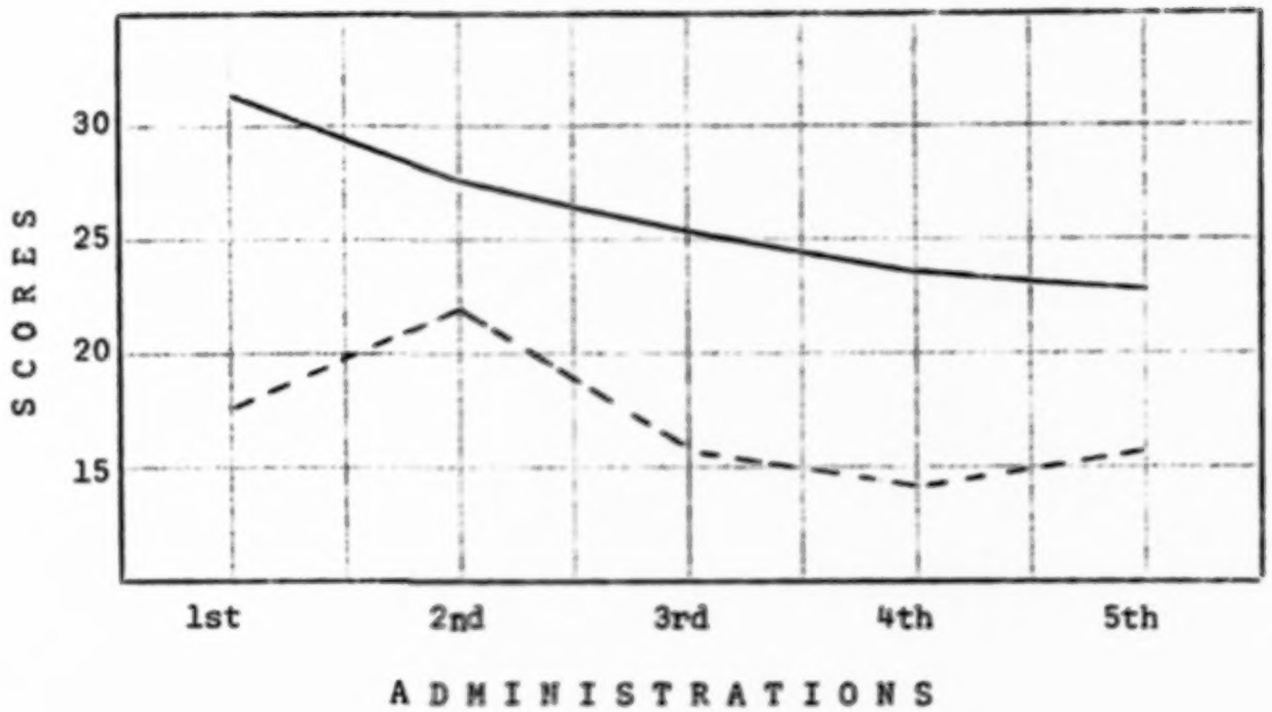

Figure 6. Changes in Attitude Toward Course Scores, Top and Bottom Groups, University of Missouri

TABLE 75

Net Pre-Post-Test Mean and Standard Deviation Changes
for Attitude Toward the Course Scores

	Group	N	Scale Administration				Net Mean Change	Net SD Change
			I		V			
			Mean	SD	Mean	SD		
Top	CSU-Fall	115	34.44	2.00	29.41	4.98	-5.03	+2.98
	CSU-Winter	89	34.48	2.41	30.58	5.04	-3.90	+2.63
	U of M	55	30.84	2.90	23.24	5.10	-7.60	+2.20
Middle	CSU-Fall	153	29.23	1.37	26.03	5.16	-3.20	+3.70
	CSU-Winter	119	27.87	1.76	27.03	4.59	- .84	+2.83
	U of M	77	25.08	1.64	19.17	5.06	-5.97	+3.42
Bottom	CSU-Fall	115	22.88	3.65	21.17	6.28	-1.71	+2.63
	CSU-Winter	89	20.57	3.94	22.00	6.30	+1.43	+2.36
	U of M	55	17.75	3.56	15.71	6.63	-2.04	+3.07

TABLE 76

Adjusted Linear, Quadratic and Cubic Regression for Attitude Toward Psychology Scores Top Group--CSU-Fall Quarter

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	529387.49	529387.49	43399.48**
b_1/b_0	1	167.58	167.58	13.74**
$b_2/b_0,b_1$	1	76.52	76.52	6.27*
$b_3/b_0,b_1b_2$	1	64.33	64.33	5.27*
Residual	571	6965.07	12.20	
Total	576	536661.00		

** Significant at the .01 level

* Significant at the .05 level

$R^2 = .042$, $R = .206$

$b_0 = 36.325$ Beta 1 -6.341 Beta 2 1.992

Beta 3 -.197

TABLE 77

Adjusted Linear, Quadratic and Cubic Regression
for Attitude Toward Psychology Scores
Bottom Group--CSU-Fall Quarter

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	365198.40	365198.40	33316.95**
b_1/b_0	1	408.02	408.02	37.22**
$b_2/b_0,b_1$	1	92.07	92.07	8.40**
$b_3/b_0,b_1,b_2$	1	13.59	13.59	1.24
Residual	571	6258.92	10.96	
Total	575	371971.00		

** Significant at the .01 level

$R^2 = .074$, $R = .272$

$b_0 = 21.741$ Beta 1 2.030 Beta 2 -.239

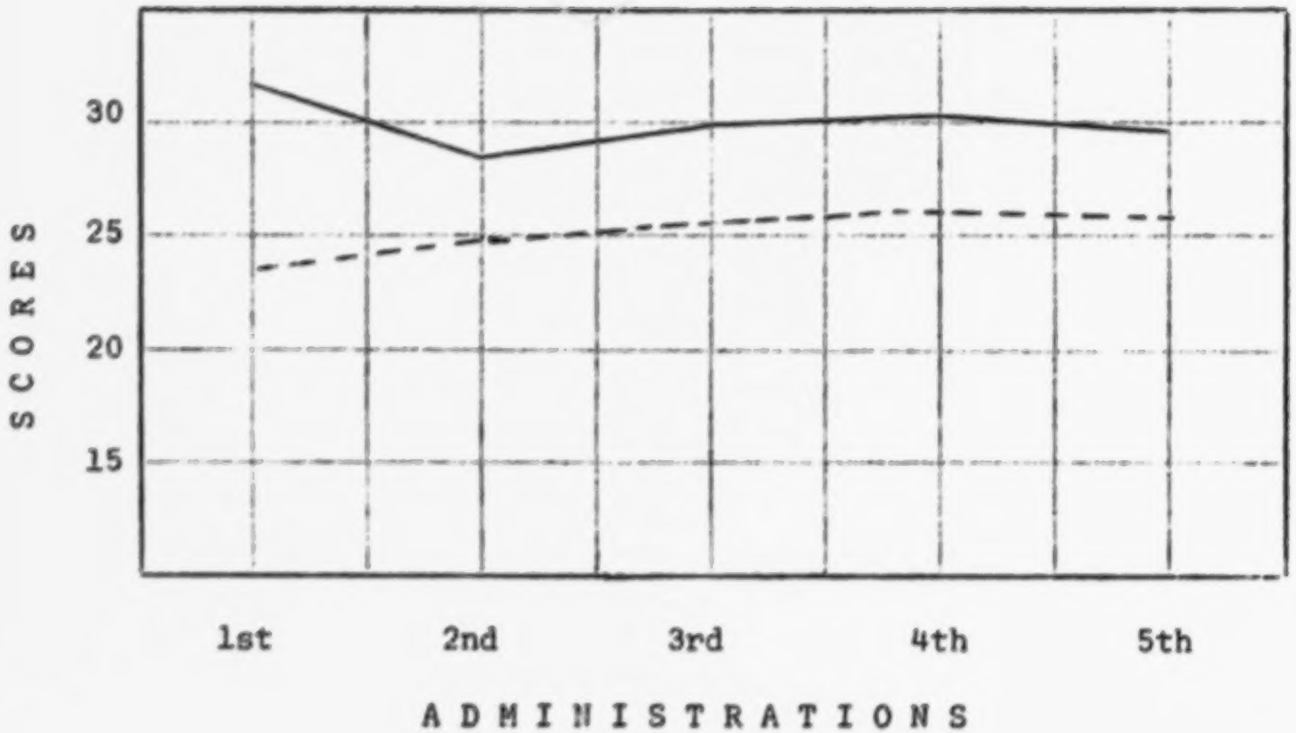

Figure 7. Changes in Attitude Toward Psychology, Top and Bottom Groups, CSU Fall Quarter

TABLE 78

Adjusted Linear, Quadratic and Cubic Regression
for Attitude Toward Psychology Scores
Top Group--CSU-Winter Quarter

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	438940.62	438940.62	43211.20**
b_1/b_0	1	75.96	75.96	7.48**
$b_2/b_0,b_1$	1	172.79	172.79	17.01**
$b_3/b_0,b_1,b_2$	1	44.94	44.94	4.42*
Residual	441	4479.69	10.16	
Total	445	443714.00		

** Significant at the .01 level

* Significant at the .05 level

R^2 = .062, R = .248

b_0 = 38.036 Beta 1 -6.946 Beta 2 2.058
Beta 3 -.187

TABLE 79

Adjusted Linear, Quadratic and Cubic Regression for Attitude Toward Psychology Scores Bottom Group--CSU-Winter Quarter

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	293173.22	293173.22	34483.36**
b_1/b_0	1	110.08	110.08	12.95**
$b_2/b_0,b_1$	1	39.20	39.20	4.61*
$b_3/b_0,b_1,b_2$	1	2.18	2.18	.26
Residual	441	3749.33	8.50	
Total	445	297074.00		

** Significant at the .01 level

* Significant at the .05 level

$R^2 = .038$, $R = .196$

$b_0 = 23.371$ Beta 1 1.416 Beta 2 -.177

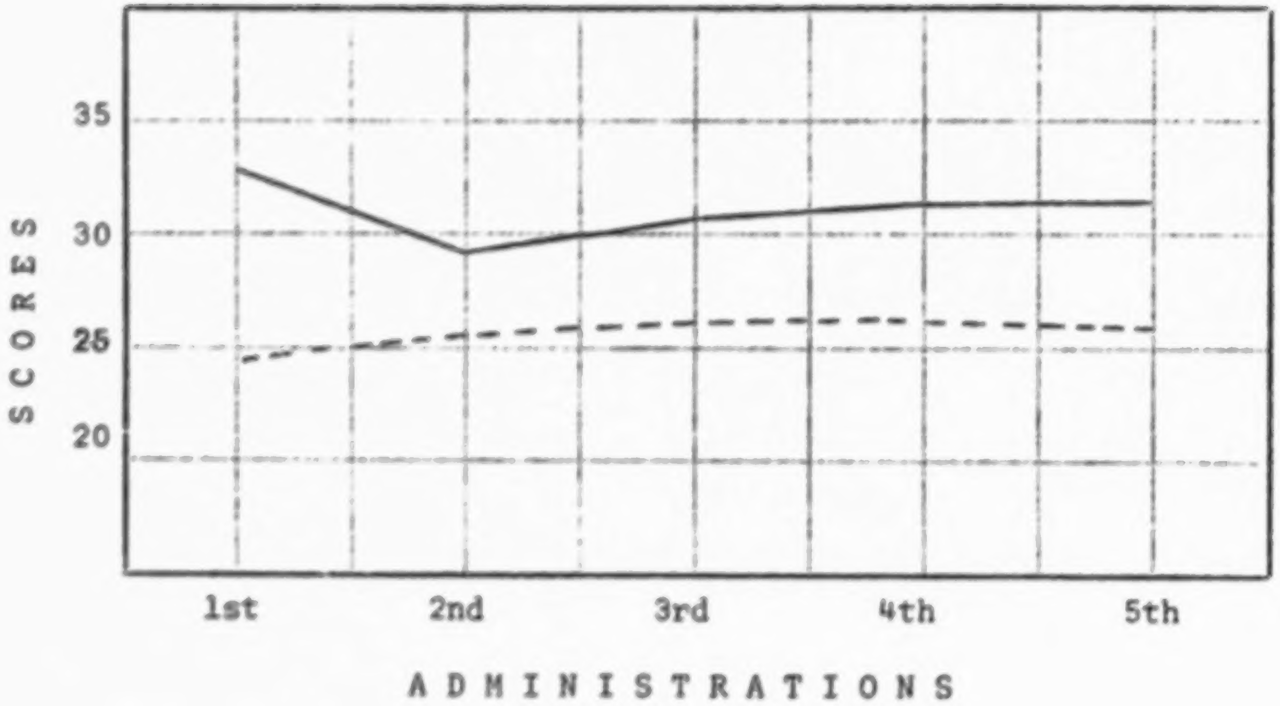

Figure 8. Changes in Attitude Toward Psychology, Top and Bottom Groups, CSU Winter Quarter

TABLE 80

Adjusted Linear, Quadratic and Cubic Regression for Attitude Toward Psychology Scores Top Group--U of M

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	243079.91	243079.91	28003.79**
b_1/b_0	1	128.65	128.65	14.82**
$b_2/b_0,b_1$	1	85.11	85.11	9.81**
$b_3/b_0,b_1,b_2$	1	1.98	1.98	.23
Residual	271	2352.35	8.68	
Total	275	245648.00		

** Significant at the .01 level

R^2 = .083, R = .289

b_0=33.509 Beta 1 -2.478 Beta 2 .332

TABLE 81

Adjusted Linear, Quadratic and Cubic Regression
for Attitude Toward Psychology Scores
Bottom Group--U of M

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	165681.82	165681.82	12415.30**
b_1/b_0	1	119.16	119.16	8.93**
$b_2/b_0,b_1$	1	59.48	59.48	4.46*
$b_3/b_0,b_1,b_2$	1	11.06	11.06	.83
Residual	271	3616.49	13.35	
Total	275	169488.00		

** Significant at the .01 level

* Significant at the .05 level

$R^2 = .047$, $R = .217$

b_0=21.204 Beta 1 2.133 Beta 2 -.278

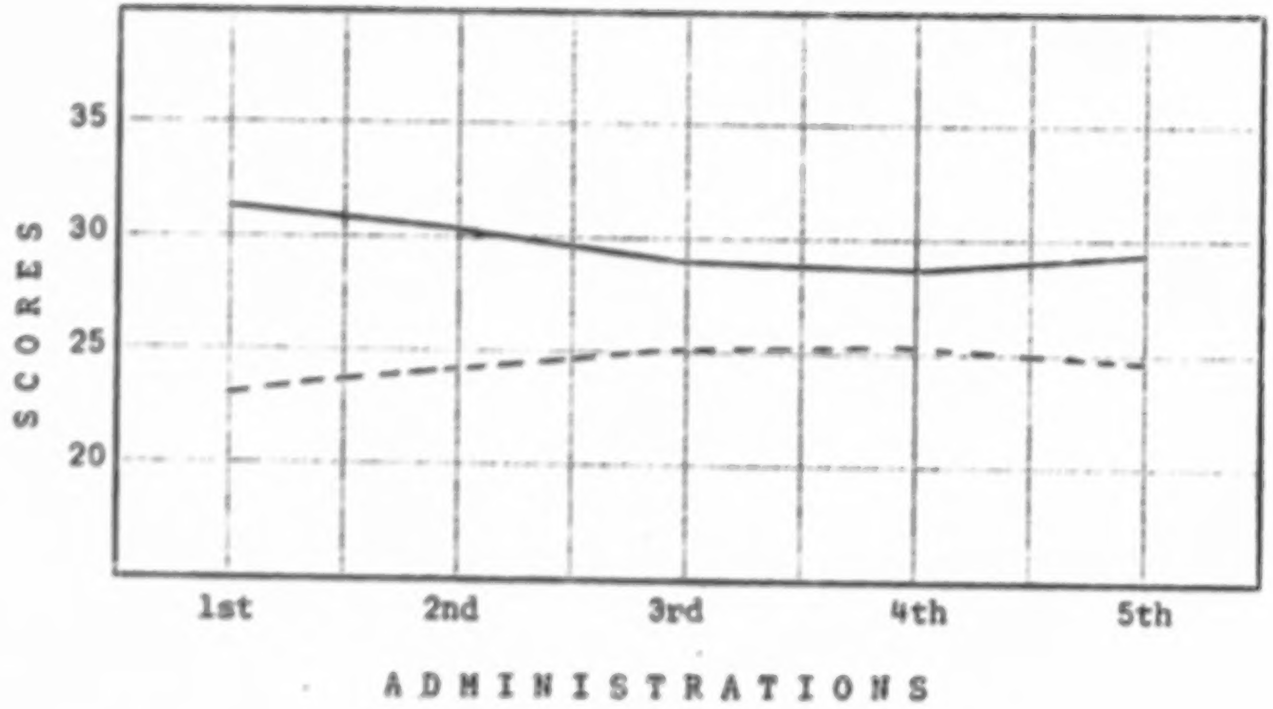

Figure 9. Changes in Attitude Toward Psychology, Top and Bottom Groups, University of Missouri

TABLE 82

Net Pre-Post-Test Mean and Standard Deviation Changes
for Attitude Toward Psychology Scores

			Scale Administration				Net	Net
			I		V		Mean	SD
	Group	N	Mean	SD	Mean	SD	Change	Change
Top	CSU-Fall	115	31.88	1.95	29.88	3.80	-2.00	+1.85
	CSU-Winter	89	33.00	1.98	31.38	3.49	-1.62	+1.51
	U of M	55	31.40	2.09	29.35	3.01	-2.05	+ .92
Middle	CSU-Fall	153	27.76	.98	28.30	3.34	+ .54	+2.36
	CSU-Winter	119	28.66	1.08	28.34	3.35	- .32	+2.27
	U of M	77	27.48	1.06	27.09	2.91	- .39	+1.85
Bottom	CSU-Fall	115	23.43	2.19	26.03	3.95	+2.60	+1.76
	CSU-Winter	89	24.54	1.94	26.04	3.54	+1.50	+1.60
	U of M	55	22.85	2.77	25.00	3.29	+2.15	+ .52

TABLE 83

Adjusted Linear, Quadratic and Cubic Regression for Achievement Scores
Top Group--CSU-Fall Quarter

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	80417.39	80417.39	20649.73**
b_1/b_0	1	20101.62	20101.62	5161.73**
$b_2/b_0,b_1$	1	146.71	146.71	37.67**
$b_3/b_0,b_1,b_2$	1	60.61	60.61	15.56**
Residual	571	2223.68	3.89	
Total	575	102950.00		

** Significant at the .01 level

R^2 = .901, R = .949

b_0 = -1.817 Beta 1 6.884 Beta 2 -1.420
Beta 3 .191

TABLE 84

Adjusted Linear, Quadratic and Cubic Regression for Achievement Scores Bottom Group--CSU-Fall Quarter

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	61963.41	61963.41	9435.36**
b_1/b_0	1	19810.03	19810.03	3016.53
$b_2/b_0,b_1$	1	9.09	9.09	1.39
$b_3/b_0,b_1,b_2$	1	252.63	252.63	38.48**
Residual	571	3749.84	6.57	
Total	575	85785.00		

** Significant at the .01 level

$R^2 = .843$, $R = .918$

$b_0 = -8.106$ Beta 1 12.917 Beta 2 -3.440
Beta 3 .391

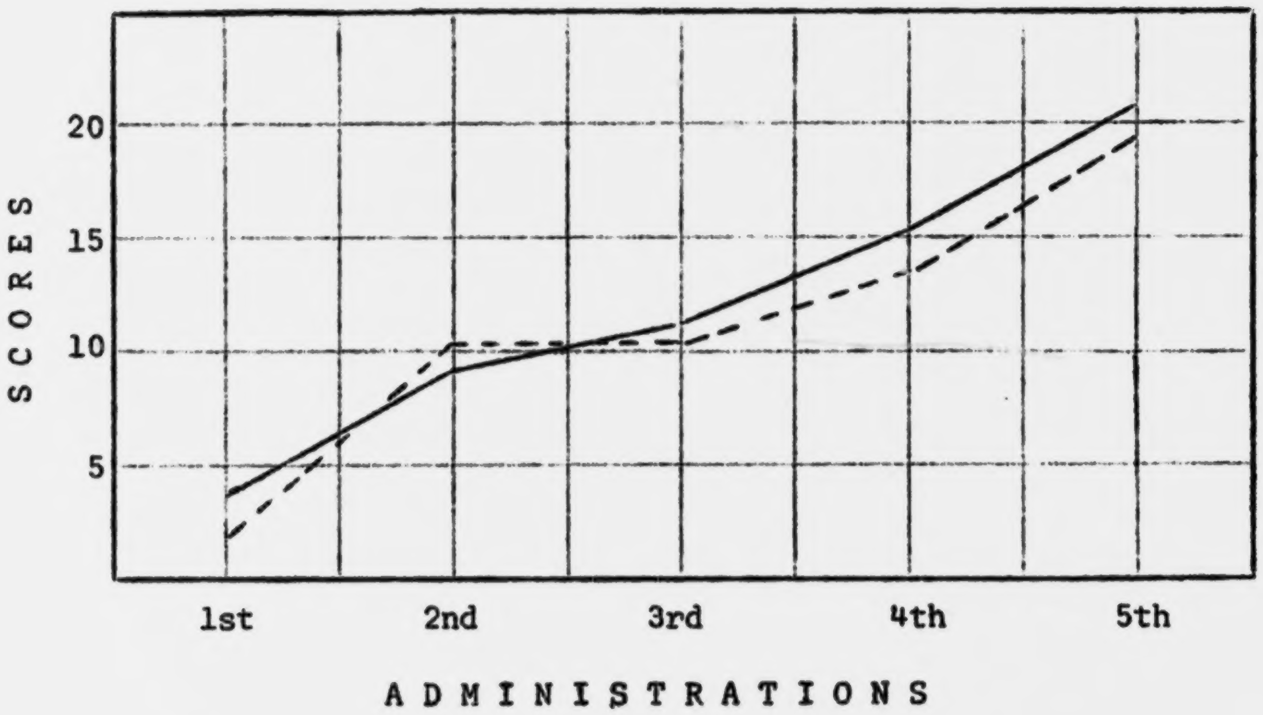

Figure 10. Changes in Achievement, Top and Bottom Groups, CSU Fall Quarter

3

TABLE 85

Adjusted Linear, Quadratic and Cubic Regression for Achievement Scores Top Group--CSU-Winter Quarter

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	71001.44	71001.44	21290.29**
b_1/b_0	1	16784.52	16784.52	5032.96**
$b_2/b_0,b_1$	1	14.20	14.20	4.26*
$b_3/b_0,b_1,b_2$	1	10.14	10.14	3.04
Residual	441	1470.70	3.34	
Total	445	89281.00		

** Significant at the .01 level

* Significant at the .05 level

$R^2 = .920$, $R = .959$

$b_0 = -1.144$ Beta 1 4.983 Beta 2 -.107

TABLE 86

Adjusted Linear, Quadratic and Cubic Regression for Achievement Scores Bottom Group--CSU-Winter Quarter

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	54043.18	54043.18	14847.87**
b_1/b_0	1	15282.41	15282.41	4198.70**
$b_2/b_0,b_1$	1	239.26	239.26	65.73**
$b_3/b_0,b_1,b_2$	1	36.00	36.00	9.89**
Residual	441	1605.15	3.64	
Total	445	71206.00		

** Significant at the .01 level

$R^2 = .906$, $R = .952$

$b_0 = -7.294$ Beta 1 10.728 Beta 2 -1.947
Beta 3 .168

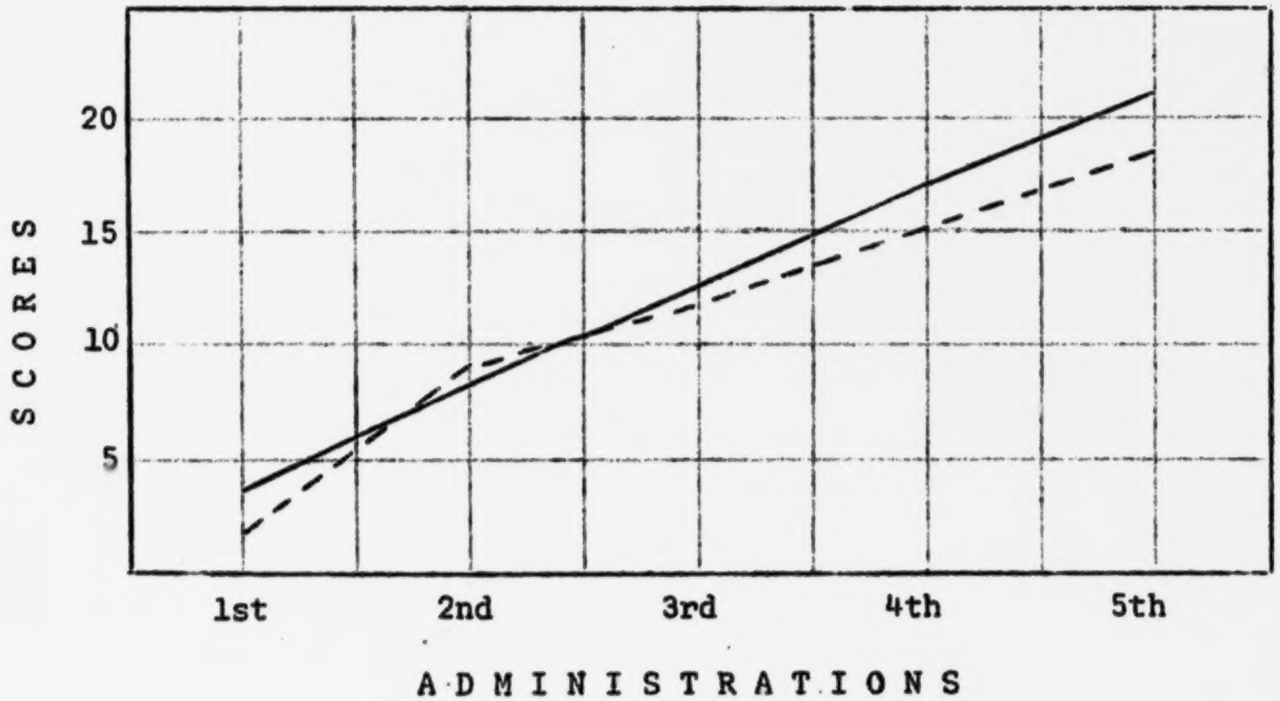

Figure 11. Changes in Achievement, Top and Bottom Groups, CSU Winter Quarter

TABLE 87

Adjusted Linear, Quadratic and Cubic Regression for Achievement Scores Top Group--U of M

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	31239.13	31239.13	7579.47**
b_1/b_0	1	6022.55	6022.55	1461.23**
$b_2/b_0,b_1$	1	224.75	224.75	54.53**
$b_3/b_0,b_1,b_2$	1	11.64	11.64	2.82
Residual	271	1116.94	4.12	
Total	275	38615.00		

** Significant at the .01 level

$R^2 = .847$, $R = .920$

$b_0 = 4.513$ Beta 1 .068 Beta 2 .540

TABLE 88

Adjusted Linear, Quadratic and Cubic Regression for Achievement Scores Bottom Group--U of M

Source of Variation	df	Sum of Squares	Mean Square	F
b_0	1	21772.85	21772.85	4909.96**
b_1/b_0	1	5279.30	5279.30	1190.47**
$b_2/b_0,b_1$	1	45.90	45.90	10.35**
$b_3/b_0,b_1,b_2$	1	8.16	8.16	1.84
Residual	271	1201.78	4.44	
Total	275	28309.00		

** Significant at the .01 level

$R^2 = .815$, $R = .903$

$b_0 = 1.313$ Beta 1 1.633 Beta 2 .244

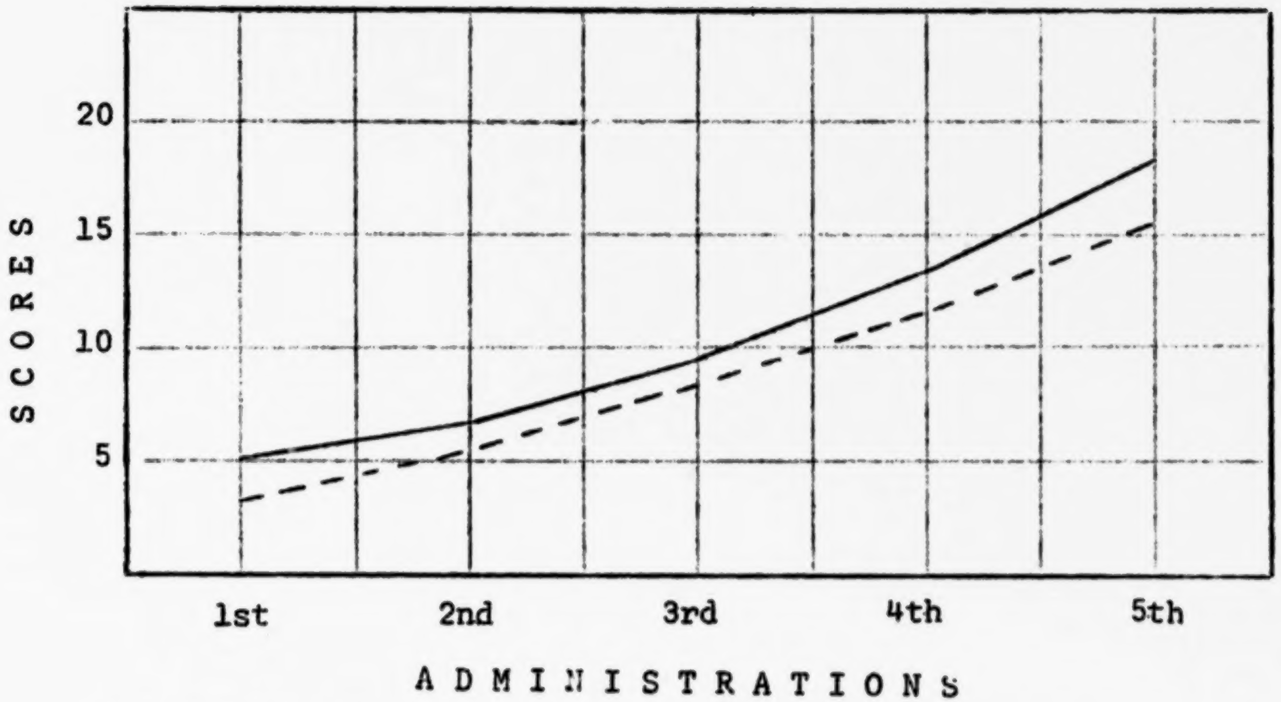

Figure 12. Changes in Achievement, Top and Bottom Groups, University of Missouri

TABLE 89

Net Pre-Post-Test Mean and Standard Deviation Changes for Achievement Scores

			Scale Administration				Net	Net
			I		V		Mean	SD
	Group	N	Mean	SD	Mean	SD	Change	Change
	CSU-Fall	115	3.64	.53	20.83	2.29	+17.19	+1.76
Top	CSU-Winter	89	3.63	.53	21.21	2.03	+17.58	+1.50
	U of M	55	5.00	.00	18.53	2.78	+13.53	+2.78
	CSU-Fall	153	2.46	.50	19.63	2.64	+17.17	+2.14
Middle	CSU-Winter	119	2.57	.50	19.76	2.56	+17.19	+2.06
	U of M	77	4.18	.39	17.95	3.21	+13.77	+2.82
	CSU-Fall	115	1.50	.61	19.04	3.09	+17.54	+2.48
Bottom	CSU-Winter	89	1.61	.54	18.58	2.50	+16.97	+1.96
	U of M	55	3.11	.74	15.75	3.38	+12.64	+2.64

Interaction. To assess the interaction between involvement and pretest position the correlation indices associated with the three variables and the two groups for the three learning situations have been assembled as follows:

		Course	Psychology	Achievement
CSU Fall	Top	.404	.206	.949
	Bottom	.169	.272	.918
Winter	Top	.291	.248	.959
	Bottom	.137	.196	.952
U of M	Top	.521	.289	.920
	Bottom	.244	.217	.903

From these data it can be seen that with the exception of the CSU Fall bottom group Attitude Toward Psychology score. All top group correlations are higher than their corresponding bottom group index. It would appear that the top group changes are consistent across the three variables with little or no interaction. In each instance evidence of the regression phenomenon is apparent. The greater the change toward the general mean during the course, the greater the consistency of change. The large number of negatively accelerating and decelerating curves found for the bottom groups in the two attitude variables confirms the regression tendency in that the attitudes moved upward toward the general mean initially but then downward, apparently since the attitudes of the total group were becoming less favorable. This, in turn, produced the lower correlation indices for the bottom group. Little or no evidence of pretest sensitization as a function of the interaction of initial position and involvement was found in the data collected for this project.

DISCUSSION AND CONCLUSIONS

The analyses of the data collected during this investigation yielded strikingly similar results in all three situations studied. The consistency of the results supports the general methodology of constructing the measuring instruments and of the design. In summarizing the findings and their implications, the same order will be followed as was used in presenting the objectives in the introductory chapter.

General Objective, Covariation of Achievements and Attitude.

To Determine the Covariation of Achievements and Attitude Measures Obtained Throughout a Learning Experience.

1. To determine the parameters of the learning curve for achievement in a general psychology course at the university level taught via instructional television.

The polynomial regression analyses made in the investigation indicate that achievement increased as a rather complex function over time. Even though the possible achievement score increased in a linear manner with the addition of five new items at each administration, the actual increase in achievement scores was best described by third and fourth degree equations in all situations. To the extent to which the achievement measures actually measured the cognitive objectives in each class, they appear to have been attained.

2. To determine the parameters of curves representing attitude change during a general psychology course when the attitudes are defined as integral portions of the course objectives.

Attitude Toward Psychology scores did not change appreciably in any situation over the course of instruction. In two classes the grand mean of the five scale administrations was the best predictor of individual scores. A slightly rising linear curve best described the attitude change in the other class. It is evident that, even though instructors in all three learning situations were committed to influencing the precise attitude items presented, Attitude Toward Psychology was not changed through the instructional procedures utilized. The affective teaching goals of the classes studied did not appear to be attained unless maintenance of the original attitude level is termed attainment of objectives.

In contrast to Achievement and to some extent, Attitude Toward Psychology, Attitude Toward the Course consistently declined in all three learning situations. The exception to this declining pattern was found in the Missouri situation where the fifth scale administration score was consistently higher than the fourth. The decline in Attitude Toward the Course as instruction proceeds supports the findings of earlier studies by Hedlund (2), Macomber and Siegel (5), and Neidt (7). Although the two attitudes involved in this study can be conceptualized as affective variables arising from participation in a learning situation, they appear to vary independently form each other.

Attitudinal and cognitive outcomes in the learning experiences studied were seemingly independent of one another in the situations studied. Intercorrelations among the three variables at each administration were relatively low. When measured at the same point in time, the attitudinal variables were consistently more closely related to each other than either of the two attitude variables in relation to achievement. This finding was evident in all three situations over all five administrations, indicating little change in the relation between pairs of the variables over time. The zero order correlations between the two attitude measurements and achievement scores at individual administrations in all classes ranged from -.04 to .27 with most coefficients near .10. There was no pattern evident among the intercorrelations to indicate points during a course when the three variables might be most closely related.

3. To assess the covariation exhibited among a) achievement, b) measures of attitude toward the learning situation (method, expectation fulfillment, and content), and c) measures of attitudes which are defined as course outcomes in a general psychology course.

A multinomial regression analysis was utilized to calculate partial correlation coefficients between each variable of the two attitude scores at each administration and final achievement. A multiple correlation coefficient was also generated in the analysis. The multiple correlation between the five Attitude Toward Psychology scores and final achievement scores were all statistically significant, clustering around .24.

Multiple correlations between Attitude Toward the Course scores and final achievement were also all significant. There was considerable variability in the magnitude of the coefficients among situations, however. Although all the multiple correlation coefficients between attitude and final achievement were statistically significant, they were so small as to be of little practical significance in a prediction circumstance. It also appears that the relationship between Attitude Toward the Course and final achievement, is more subject to unique situational factors than is the relationship with Attitude Toward Psychology.

The partial coefficients of correlation between Attitude Toward Psychology scores and final achievement indicated a consistent pattern in all three situations. The first and/or second administration scores correlated significantly with final achievement in all classes. Also, in all classes there was a reversal in the direction of the relationship with final achievement between the first and second attitude scale administrations. In the three situations studied, attitude toward subject matter was not significantly related to final course achievement after approximately the first 40% of the course. After the first 40% of a course had elapsed there was a generally decreasing trend in the relationship of Attitude Toward Psychology and final achievement.

No general pattern of changes in the magnitude of relationships between Attitude Toward the Course and final achievement was evident. In one situation, the first three administration scores were increasingly related to fifth achievement scores. In another situation, there were no significant partial correlation coefficients. The second and fifth administration scores were related significantly to final achievement in the last situation. The previous conclusion that the relationship between Attitude Toward the Course and final achievement scores seems subject to unique situational factors, including specific time periods within the course.

4. To determine the relationship between achievement-attitude covariation and a) initial or pretest achievement and b) final achievement in a general psychology course.

In addition to the foregoing analyses related to this objective, subgroups of students with attitudes having progressions different from their own group were studied for change in achievement. Mean achievement scores of two groups of students having midrange Attitude Toward Psychology scores initially and diverging into high and low attitude scores at the end of the course were nearly identical with the mean of the total group. The attainment of cognitive goals does not lead automatically to the attainment of affective goals. No evidence was found to support an indentifiable pattern of relationships between change in attitude and initial or final measure.

General Objective, Pretest Sensitization

To Evaluate Two Theoretical Models Explaining Pretest Sensitizations, the First in Terms of Learner Involvement and the Second in Terms of Pretest Attitude and Favorability of the Learning Experience.

1. To evaluate the role of learner involvement in pretest sensitization by applying the Neidt six-group design to achievement data (maximum involvement), course attitude (partial involvement), and attitude toward course data (minimum involvement) in a general psychology course.

In two of the three minimum involvement situations studied, there was evidence of pretest sensitization in the opposite direction from that predicted on the basis of previous research and in the third minimal involvement situation and the other six situations there was no evidence of relationship between involvement and pretest sensitization. Inasmuch as minimum involvement carried least connotation of being evaluated on the basis of an expressed attitude, it is reasonable to postulate that students may have been willing to express deviant attitudes more freely and therefore took a more extreme position than with the other two variables. Evidence from this investigation does not support the involvement hypothesis as postulated, however.

It is conceivable that in the situations studied the delay in assessing initial reaction may have negated what might otherwise have been considered as pretest sensitization. It will be recalled that the initial administration took place after 20% of the course had elapsed. If this delay did have the effect of cancelling what would have been pretest sensitization had the measurement been made earlier, different results might have been obtained. A different testing procedure is necessary to assess such a possibility, however. It is suggested that the present investigation be repeated with the initial assessment being made prior to any instruction.

2. To evaluate the role of pretest position (favorable or unfavorable) in pretest sensitization by examining the parameters of mathematical equations based upon high, middle and low portions of the initial distributions for attitude and achievement data.

When attitudes of subgroups of students (top 30% and bottom 30%) of the initial distribution were examined, evidence of regression toward the overall mean was identifiable. In the top subgroup this usually took the form of a straight line with negative slope. For the bottom group this took the form of a slight negative curve. The curve for the bottom group was more apparent in the Attitude Toward the Course data than in the Attitude Toward Psychology data. This was explained in terms of the gradual decline in the overall Attitude Toward the Course trend. It was postulated that the regression phenomenon would cause unfavorable students to drift upward toward the mean in the initial stages of the course but that since the general mean was becoming less favorable as the course progressed, the attitudes of those students would again decline in the latter stages. It was concluded that evidence of regression more than sensitization was present in the data.

3. To evaluate the role of general reaction toward the learning experience in relation to a) involvement and b) pretest position by applying the Neidt six-group design to attitude and achievement data in a general psychology course.

When Attitudes Toward Psychology and achievement of students who were most and least favorable to the course were examined, little or no evidence of interaction between involvement and pretest position could be found. It appears that either there is no relation between attitude and achievement with respect to initial position and involvement or that the attitudes of students who complete a course are not sufficiently negative or positive to have a depressing or increasing influence on cognitive outcomes. Separate assessment and separate teaching efforts to reach goals involving these two kinds of variables appear warranted.

Conclusions

On the basis of evidence obtained in this investigation, the following conclusions are reached:

1. In conventional general psychology courses, change in Attitude Toward the Course and Attitude Toward Psychology are more closely related to each other than either one is to cognitive achievement.

2. Whereas definite and identificable progres toward cognitive course objectives in general psychology is reflected in conventional courses, such is not the case for Attitudes Toward Psychology. These attitudes apparently are not only independent of but require different techniques to modify, than cognitive outcomes.

3. Regression toward the general trend over time is associated with repeated measures of attitudes of subgroups defined as being at the extremes of the initial assessment.

4. In a learning experience extending over a period of time such as an academic quarter or semester, assessment of variables prior to any formal learning is an essential condition for the investigation of pretest sensitization.

It is recommended that instructional techniques designed to modify student attitudes considered as desired course outcomes be investigated experimentally as a logical extension of the present research. Instructors of general psychology are presently experiencing little success in modifying student attitudes about the subject matter in desired directions.

SUMMARY

Major purposes of this project were 1) to determine the covariation among achievement, attitudes toward a course and attitudes specifically taught as part of a course; and 2) to evaluate two theoretical models explaining pretest sensitization - the first in terms of learner involvement and the second in terms of pretest position. The specific objectives were as follows:

1. To determine the parameters of the learning curve for achievement in a general psychology course at the university level taught via instructional television.

2. To determine the parameters of curves representing attitude change during a general psychology course when the attitudes are defined as integral portions of the course objectives.

3. To assess the covariation exhibited among (a) achievement measures, (b) measures of attitudes toward the learning situation (method, expectation, fulfillment, and content), and (c) measures of attitudes which are defined as course outcomes in a general psychology course.

4. To determine the relationship between achievement-attitude covariation and (a) initial or pretest achievement, and (b) final achievement in a general psychology course.

5. To evaluate the role of learner involvement in pretest sensitization by applying the Neidt six-group design to achievement data (maximum involvement), course attitude data (partial involvement), and attitude toward the course data (minimum involvement) in a general psychology course.

6. To evaluate the role of pretest position (favorable or unfavorable) in pretest sensitization by examining the parameters of mathematical equations for the remainder of the course based upon high, middle and low portions of the initial distribution for attitudes and achievement data.

7. To evaluate the role of general reaction toward the learning experience in relation to (a) involvement and (b) pretest position by applying the Neidt six-group design to attitude and achievement data in a general psychology course.

Design

The present study was an extension of a project by Neidt initiated in 1962 and supported by the United States Office of Education. In the earlier research, five parallel forms of a 26-item scale measuring attitudes toward method, expectation, and content were administered to students of varying ages in 72 instructional settings. Since the attitudes of learners became progressively less favorable as the courses proceeded, it was considered essential to develop a research design which would assess the extent to which the changes in attitude might be the result of previous test administrations. The widely-used Solomon four-group design was extended to include six groups wherein test administrations were made from one to five times throughout the course. This design requires five equivalent forms of an instrument for measuring each characteristic and learning situation in which material is learned in six separate settings simultaneously. The design is ideally suited for the medium of educational television but not well suited for other instructional media. The design also is well suited for investigating covariation in attitude and achievement as well as pretest sensitization. For the foregoing reasons, this design was employed in the present study in two university settings where videotaped instructional television was being used as the teaching medium.

Situation and Subjects

A total of 1324 students enrolled in introductory psychology at Colorado State University and at the University of Missouri participated in this study. The learning situations involved were introductory classes in general psychology taught via a closed-circuit television lecture series. The Fall 1967 Introductory Psychology class at Colorado State University (N = 538), the Winter 1967 Introductory Psychology class at Colorado State University (N = 461) and the Spring 1967 Introductory Psychology class at the University of Missouri (N = 325) constituted the total sample for the investigation

Both of the Colorado State University courses were divided into sections of approximately 40 students each. The University of Missouri course was divided into sections of 25 to 30 students each. One to five repeated measurements of the three variables in the study, Attitude Toward Psychology, Attitude Toward the Course, and Achievement were made to detect changes during the course of instruction. Two ten-item attitude scales were constructed in five equivalent forms, and a pool of objective achievement items was constructed covering topics presented in the course. Attitude and achievement measures were obtained subsequent to each 20% of the course of instruction according to a six-group modified Solomon design. Achievement tests were designed so as to cover each 20% of the course of instruction with five items and to cover subject matter presented since the beginning of the course at each administration. Thus, subsequent achievement measures each had five additional items resulting in a total of 25 items in the final achievement test.

Analyses

Each of the three learning situations was treated separately in the analyses. Curves were fitted to each variable over time, utilizing a polynomial regression analysis. The resulting regression equations were compared as functions describing the variables under study. Inferences concerning points at which changes in one variable were related to changes in other variables were also made. The relationship between each attitude administration score and the final achievement score was also assessed by calculating partial correlation coefficients between attitude administration scores and final achievement. Analyses of variance were computed within each test administration point and groups having had several test administrations. Curves were then fitted to the upper 30%, middle 40% and lower 30% of each initial test distribution to assess pretest sensitization as a function of initial test distribution position.

Results

The polynomial regression analyses made in the investigation indicate that achievement increased as a rather complex function over time. Even though the possible achievement scores increased in a linear manner with the addition of five new items at each administration, the actual increase in achievement scores was best described by third and fourth degree equations in all situations. To the extent to which the achievement measures actually measured the cognitive objectives in each class, they appear to have been attained.

Attitude Toward Psychology scores did not change appreciably in any situation over the course of instruction. In two classes the grand mean of the five scale administrations was the best predictor of individual scores. A slightly rising linear curve best described the attitude change in the other class. It is evident that, even though instructors in all three learning situations were committed to influencing the precise attitude items presented, Attitude Toward Psychology was not changed through the instructional procedures utilized. The affective teaching goals of the classes studied did not appear to be attained unless maintenance of the original attitude level is termed attainment of objectives.

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4. In a learning experience extending over a period of time such as an academic quarter or semester, assessment of variables prior to any formal learning is an essential condition for the investigation of pretest sensitization.

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APPENDIX

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DIRECTIONS TO BE READ TO CLASS

The University of Missouri is cooperating with several other universities in a research project to determine how college students feel about certain of their courses. This is a nation-wide project sponsored by the United States Office of Education. This class has been asked to participate in this project. Participation means filling out several brief questionnaires indicating how you feel about psychology in general and this course in particular as it progresses. Today we are going to complete the first questionnaire. Your responses will in no way affect your grade. In fact, your instructor will not see them. When all students have completed their questionnaires, they will be passed to the front and then to the right so that the student sitting in that particular seat can place them in an envelope and seal them before returning them.

Let us now look at the scale.

(Distribute scales and envelope)

Notice that you are to place your identification number in the upper right hand corner of the scale. Please do so now.
Read the directions and complete the scale.

ATTITUDE SCALE, Form A

____
Name

This scale has been prepared so that you can indicate how you feel about psychology in general and about Py 10 in particular. PLEASE RESPOND TO EVERY ITEM. In each case, draw a circle around the letter which represents your own reaction as follows:

SA	if you strongly agree with the statement
A	if you agree but not strongly so
N	if you are neutral or undecided
D	if you disagree but not strongly so
SD	if you strongly disagree with the statement

Remember, the only correct answer is the one which actually represents your opinion. Your responses will not affect your grade.

1. I like the method used in teaching this course . SA A N D SD
2. I am disappointed with this course . . . . SA A N D SD
3. I am enthusiastic about the content of this course . . . . SA A N D SD
4. The method of instruction used in this course could be improved greatly . . . . SA A N D SD
5. This course has not fulfilled the hopes I had for it . . . . SA A N D SD
6. Too much emphasis in this course is placed on unimportant topics . . . . SA A N D SD
7. The amount of material covered in this course is about right . . . . SA A N D SD
8. This course has increased my interest in psychology . . . . SA A N D SD
9. I am glad that I am in this course . . . . SA A N D SD
10. The study of psychology is not worth the time required . . . . SA A N D SD
11. The scientific method is inappropriate for studying human behavior . . . . SA A N D SD
12. Human behavior is influenced by many of the same forces that influence animal behavior . . . . . SA A N D SD
13. The adult human depends on instincts more than we realize . . . . SA A N D SD
14. The causes of behavior can be learned . . . . . SA A N D SD
15. All people have the same potential to learn. . . SA A N D SD
16. Psychology offers great promise for improving man's existence. . . . . SA A N D SD
17. All aspects of life, no matter how intimate, are worthy topics for research. . . . . SA A N D SD
18. Psychological tests are scientific instruments . SA A N D SD
19. It will never be possible to predict human behavior with any degree of accuracy . . . . . SA A N D SD
20. Intelligence is entirely inherited . . . . SA A N D SD

ATTITUDE SCALE, Form B

____
Name

This scale has been prepared so that you can indicate how you feel about psychology in general and about Py 10 in particular. PLEASE RESPOND TO EVERY ITEM. In each case, draw a circle around the letter which represents your own reaction as follows:

SA if you strongly agree with the statement
A if you agree but not strongly so
N if you are neutral or undecided
D if you disagree but not strongly so
SD if you strongly disagree with the statement

Remember, the only correct answer is the one which actually represents your opinion. Your response will not affect your grade.

1. The amount of material covered in this course is about right . . . . SA A N D SD
2. This course has been a disappointment to me . . SA A N D SD
3. I am enthusiastic about the content of this course . . . . SA A N D SD
4. Unimportant topics receive too much emphasis in this course . . . . SA A N D SD
5. I am satisfied with the method used in teaching this course . . . . SA A N D SD
6. The method of instruction used in this course could be improved a lot . . . . SA A N D SD
7. This course has increased my interest in psychology . . . . SA A N D SD
8. The study of psychology is not worth the time it takes . . . . SA A N D SD
9. I am glad that I took this course . . . . SA A N D SD
10. I had hoped that this course would be better than it is . . . . SA A N D SD
11. Psychology offers a great promise for improving man's existence . . . . SA A N D SD
12. All aspects of life, no matter how intimate, are worthy topics for research . . . . SA A N D SD
13. Psychological tests are scientific instruments . SA A N D SD
14. It will never be possible to predict human behavior with any degree of accuracy . . . . . . SA A N D SD
15. Intelligence is entirely inherited . . . . SA A N D SD
16. The scientific method is inappropriate for studying human behavior . . . . SA A N D SD
17. Human behavior is influenced by many of the same forces that influence animal behavior. . . . . . SA A N D SD
18. The adult human depends on instincts more than we realize . . . . SA A N D SD
19. The causes of behavior can be learned . . . . . SA A N D SD
20. All people have the same potential to learn . . SA A N D SD

ATTITUDE SCALE, Form C

____
Name

This scale has been prepared so that you can indicate how you feel about psychology in general and bout Py 10 in particular. PLEASE RESPOND TO EVERY ITEM. In each case, draw a circle around the letter which represents your own reaction as follows:

SA	if you strongly agree with the statement
A	if you agree but not strongly so
N	if you are neutral or undecided
D	if you disagree but not strongly so
SD	if you strongly disagree with the statement

Remember, the only correct answer is the one which actually represents your opinion. Your response will not affect your grade.

1. I like the content of this course very much . . . SA A N D SD
2. I am satisified with the method used in teaching this course . . . . SA A N D SD
3. Too much time in this course is spent on topics that are unimportant . . . . SA A N D SD
4. I am glad I took this course . . . . SA A N D SD
5. This course has increased my interest in psychology . . . . SA A N D SD
6. This course has been a disappointment to me . . . SA A N D SD
7. The amount of material covered in this course is about right . . . . SA A N D SD
8. The study of psychology is not worth the time it takes . . . . SA A N D SD
9. The method of instruction in this course could be improved a lot . . . . SA A N D SD
10. I had hoped that this course would be better than it is . . . . SA A N D SD
11. The scientific method is inappropriate for studying human behavior . . . . SA A N D SD
12. Human behavior is influenced by many of the same forces that influence animal behavior . . . . SA A N D SD
13. The adult human depends on instincts more than we realize . . . . SA A N D SD
14. The causes of behavior can be learned . . . . SA A N D SD
15. All people have the same potential to learn . . . SA A N D SD
16. Psychology offers great promise for improving man's existence . . . . SA A N D SD
17. All aspects of life, no matter how intimate, are worthy topics for research . . . . SA A N D SD
18. Psychological tests are scientific instruments. . SA A N D SD
19. It will never be possible to predict human behavior with any degree of accuracy. . . . . SA A N D SD
20. Intelligence is entirely inherited . . . . SA A N D SD

ATTITUDE SCALE, Form D

____
Name

This scale has been prepared so that you can indicate how your feel about psychology in general and about Py 10 in particular. PLEASE RESPOND TO EVERY ITEM. In each case, draw a circle around the letter which represents your own reaction as follows:

SA if you strongly agree with the statement
A if you agree but not strongly so
N if you are neutral or undecided
D if you disagree but not strongly so
SD if you strongly disagree with the statement

Remember, the only correct answer is the one which actually represents your opinion. Your response will not affect your grade.

1. I like the method used in teaching this course . . SA A N D SD
2. I am disappointed with this course . . . . SA A N D SD
3. I am enthusiastic about psychology . . . . SA A N D SD
4. The method of instruction used in this course could be improved greatly . . . . SA A N D SD
5. This course has not fulfilled the hopes I had for it . . . . SA A N D SD
6. Too much emphasis is placed on topics that are unimportant in this course . . . . SA A N D SD
7. The amount of material covered in this course is about right . . . . SA A N D SD
8. This course has increased my interest in psychology . . . . SA A N D SD
9. I am glad that I took this course . . . . SA A N D SD
10. I had hoped that this course would be better than it is . . . . SA A N D SD
11. Psychology offers great promise for improving man's existence . . . . SA A N D SD
12. All aspects of life, no matter how intimate, are worthy topics for research . . . . SA A N D SD
13. It will never be possible to predict human behavior with any degree of accuracy . . . . SA A N D SD
14. Psychological tests are scientific instruments . . SA A N D SD
15. Intelligence is entirely inherited . . . . SA A N D SD
16. The scientific method is inappropriate for studying human behavior . . . . SA A N D SD
17. Human behavior is influenced by many of the same forces that influence animal behavior . . . . SA A N D SD
18. The adult human depends on instincts more than we realize . . . . SA A N D SD
19. The causes of behavior can be learned . . . . SA A N D SD
20. All people have the same potential to learn . . . SA A N D SD

ATTITUDE SCALE, Form E

____
Name

This scale has been prepared so that you can indicate how you feel about psychology in general and about Py 10 in particular. PLEASE RESPOND TO EVERY ITEM. In each case, draw a circle around the letter which represents your own reaction as follows:

SA	if you strongly agree with the statement
A	if you agree but not strongly so
N	if you are neutral or undecided
D	if you disagree but not strongly so
SD	if you strongly disagree with the statement

Remember, the only correct answer is the one which actually represents your opinion. Your response will not affect your grade.

1. Too much emphasis is placed on topics that are unimportant in this course . . . . SA A N D SD
2. This course has increased my interest in psychology . . . . SA A N D SD
3. I am glad that I took this course . . . . SA A N D SD
4. I had hoped that this course would be better than it is . . . . SA A N D SD
5. The amount of material covered in this course is about right . . . . SA A N D SD
6. I am disappointed with this course . . . . SA A N D SD
7. I am enthusiastic about psychology . . . . SA A N D SD
8. The method of instruction used in this course could be improved greatly . . . . SA A N D SD
9. I like the method used in teaching this course. . SA A N D SD
10. This course has not fulfilled the hopes I had for it . . . . SA A N D SD
11. Psychological tests are scientific instruments. . SA A N D SD
12. Psychology offers great promise for improving man's existence . . . . SA A N D SD
13. All aspects of life, no matter how initmate, are worthy topics for research . . . . SA A N D SD
14. It will never be possible to predict human behavior with any degree of accuracy . . . . . . SA A N D SD
15. Intelligence is entirely inherited. . . . . SA A N D SD
16. The adult human depends on instincts more than we realize . . . . SA A N D SD
17. The scientific method is inappropriate for studying human behavior . . . . SA A N D SD
18. Human behavior is influenced by many of the same forces that influence animal behavior . . . . . . SA A N D SD
19. The causes of behavior can be learned . . . . . . SA A N D SD
20. All people have the same potential to learn . . . SA A N D SD